ENCODER PRODUCTS COMPANY

Industrial Encoders & Accessories Catalog

Issue No. 8

50th Anniversary Edition

encoder.com

ENCODER SOLUTIONS THAT JUST MAKE SENSE.

Company History

Encoder Products Company, Inc. is a leading designer and world-wide manufacturer of motion sensing devices. Founded in 1969 by William Watt, EPC began operations with a small line of custom encoders. Today, EPC's popular Accu-Coder™ brand is the most complete line of incremental and absolute shaft encoders in the industry. Our core philosophy is that each and every customer deserves quality products, superior customer service, and expert support.

Business Partnerships

Fostering long-term business partnerships with satisfied customers is what we do best, and is at the heart of our mission. We take pride in providing superior customer service and supplying our customers with encoders that function precisely, dependably, and flawlessly. Listening to our customers needs, and designing products that provide solutions for them, is a key to our success.

Setting the Standard

At EPC, we concentrate on encoders, and we have a long list of "firsts" to our name.

- First to design the cube style encoder, now an industry standard.
- First to resolve mounting installation problems by providing a flexible-mounting system.
- First to include Opto-ASIC technology, which virtually eliminates miscounts by eliminating electrical noise and enhancing signal quality.
- First to provide an encoder that operates at 120° C.
- First to provide 6000 CPR in a 1.5" diameter encoder.
- First to provide a 3 year standard warranty because we stand proudly behind the reliability of each of our products.

We will continue to do what we do best so that you can have the very best encoder for the job.

Solving Problems

We believe that an encoder supplier should solve problems, not cause them. Since 1969, we have been solving encoder problems with our custom designs, faster delivery, and reliable products – which set us apart from the competition.

Custom Encoders Our Specialty

Through years of experience, we understand that each industrial environment is different and that you need an encoder that fits your specific situation. Ultimately, this means not having to make due with someone else's specifications or configurations, but having your own custom designed unit. Many of our customers have come to depend on us for this special area of customization, because we can design and deliver custom encoders faster than most suppliers' standard products; standard delivery time for most products is just 4 to 6 days business days, and we offer same-day expedite options on many products.

ISO 9001 Quality Systems

At EPC, quality is designed into every product. Before it's offered for sale, each new Accu-Coder™ model is fully tested against EPC's exacting quality standards. But quality doesn't stop at design: during the manufacturing process, each Accu-Coder™ is subjected to a series of stringent quality control tests to ensure you are receiving the best encoder available. Our quality system has successfully been audited to the requirements of ISO 9001:2015, an internationally recognized standard for comprehensive Quality Systems. By paying close attention to detail, our Accu-Coder™ brand has become known throughout the industry for quality and reliability.

EPC ENCODER PRODUCTS COMPANY

800.366.5412 | www.encoder.com

EPC's world headquarters in Sagle, Idaho.





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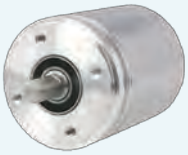
- 58 mm Diameter Package
- Hollow Bore Construction
- Durable Magnetic Technology

Pg 12 Ø58 mm

Model A58SE
- EtherCAT Deterministic Communication: CoE, FoE, EoE
- 58 mm Diameter Package
- Shaft Unit with 2 Mounting Options
- Durable Magnetic Technology

Pg 14 Ø36 mm

Model A36HB
- Multiturn or Single Turn Absolute Encoder
- Durable Magnetic Technology
- Standard Size 36 mm Package (1.42")
- SSI and CANopen Communications
- New Turns Counting Technology— No Gears or Batteries



Pg 16 Ø36 mm

Model A36SB
- Multiturn or Single Turn Absolute Encoder
- Durable Magnetic Technology
- Standard Size 36 mm Package (1.42")
- SSI and CANopen Communications
- New Turns Counting Technology— No Gears or Batteries

Pg 18 Ø58 mm

Model A58HB
- Up to 14 Bits of Single-Turn Resolution
- SSI and CANopen Communications
- 58 mm Diameter
- Durable Magnetic Technology

Pg 20 Ø2.5"

Model A25SB
- Standard size 25 package (2.5" x 2.5")
- Durable magnetic technology — no gears or batteries
- Servo and flange mounting
- Multi-turn absolute encoder (14-bit/39-bit)

Pg 22 Ø2.5"

Model 925
- Industrial Housed 2.5" Single Turn Absolute
- Gray, Natural Binary, and Excess Gray Codes
- Shaft Sizes to 0.375", or 10 mm
- Flange and Servo Mounts
- Sealing Up to IP67

Pg 24 Ø2.0"

Model 960
- Low Profile - 1.55" Single Turn Absolute
- Opto-ASIC Circuitry in an All Metal Housing
- Resolutions to 11 Bits
- Bore Sizes to 0.375", or 10 mm
- A Variety of Flexible Mounting Brackets

LINEAR MEASUREMENT SOLUTIONS

Pg 28

Model TR1
- Integrated Encoder & Measuring Wheel
- Spring Loaded Torsion Arm Installs in Vertical, Horizontal, or Upside-Down Orientation
- Resolutions to 10,000 CPR
- Sealing Up to IP66

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Model TR2
- Integrated Encoder & Rack&Pinion Gear
- Spring Loaded Torsion Arm Installs in Vertical, Horizontal, or Upside-Down Orientation
- Resolutions to 10,000 CPR
- Sealing Up to IP66

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Model TR3
- Integrated Heavy Duty Encoder & Measuring Wheel
- Easily Installs in a Vertical, Horizontal, or Upside-Down Orientation
- Resolutions to 10,000 CPR
- Single or Dual Wheel

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Model LCE
- Linear Cable Measurement Up to 50 inches
- Resolutions From 2 to 500 Cycles Per Inch
- Low Cost Linear Solution
- Sealing Up to IP65
- Many Mounting/Cable Exit Configurations

INCREMENTAL THRU-BORE & MOTOR MOUNT ENCODERS

Pg 40 Ø1.5”

Model 15T/H
- Resolutions to 10,000 CPR
- Up to 12 Pole Commutation Available
- Bore Sizes to 0.375”, or 10 mm
- Operating Temps from -40° to 120° C
- Sealing Up to IP64

Pg 44 Ø1.5”

Model 755A
- Resolutions to 30,000 CPR
- Bore Sizes to 0.750”, or 14 mm
- A Variety of Flexible Mounting Brackets
- Operating Temps from -40° to 100° C
- Frequencies to 1 MHz

Pg 46 Ø2.0”

Model 260
- Resolutions to 10,000 CPR
- Bore Sizes to 0.625”, or 15 mm
- A Variety of Flexible Mounting Brackets
- Operating Temps from -40° to 120° C
- Sealing Up to IP64

Pg 50 Ø2.25”

Model 225A/Q
- Single Channel & Quadrature
- Economical Tachometer
- Motor Feedback
- Bore Sizes to 0.875”, or 22 mm

Pg 52 Ø2.5”

Model 25T/H
- Replaces 2.0” to 3.5” Encoders
- Resolutions to 10,000 CPR
- Bore Sizes to 1.125”, or 28 mm
- Versatile Flexible Mounting Options
- Operating Temps from -40° to 105° C

Pg 54 Ø58 mm

Model 58TP/HP Programmable
- Programmable with USB Module or Factory Configured when Ordered
- Programmable Resolution from 1 to 65,536 CPR
- Programmable output type and waveform

Pg 58 Ø58 mm

Model 58TF/HF
- 58 mm package available in thru-bore or hollow bore
- Resolutions from 1 to 65,536 CPR
- 6 different output types
- 32 different waveforms available

Pg 60 Ø4.3”

Model 775
- Slim Profile - to 1.36” Thru-Bores
- Resolutions to 4096 CPR
- Bore Sizes to 1.875”, or 43 mm
- Large Selection of Connector Options
- Operating Temps from 0° to 100° C

Pg 62 Ø4.3”

Model 776
- Slim Profile - to 1.36” Thru-Bores
- Resolutions to 4096 CPR
- Bore Sizes to 1.875”, or 43 mm
- Large Selection of Connector Options
- Operating Temps from 0° to 100° C

Pg 66 Ø6.5”

Model 770
- Fits NEMA Frame Size 56C Thru 184C
- Resolutions to 4096 CPR
- Bore Sizes to 1.00”, or 24 mm
- Large Selection of Connector Options
- Operating Temps from 0° to 100° C

Pg 68 Ø9.0”

Model 771
- Fits NEMA Frame Size 182TC Thru 256TC
- Standard Double C-Face
- Resolutions to 4096 CPR
- Bore Sizes to 1.875”, or 43 mm
- Optional protective cover affords IP65 Seal

QUICK SELECTION GUIDE

INCREMENTAL SHAFT ENCODERS

Pg 70-77 Ø2.25”

Models 711, 715 & 716

- The Original Cube Encoders
- Single Channel, Quadrature and Timed Pulse
- Five Versatile Heavy Duty Housing Styles
- Resolutions to 10,000 CPR
- Single and Double Shaft Options

Pg 78 Ø1.5”

Model 15S

- Resolutions to 10,000 CPR
- Up to 12 Pole Commutation Available
- Wide Variety of Mounting Options
- Operating Temps from -40° to 120° C
- Sealing Up to IP64

Pg 82 Ø1.5”

Model 755A

- Resolutions to 30,000 CPR
- Frequencies to 1 MHz
- A Variety of Servo and Flange Mounts
- Available with In-Line M12 Connectors
- Operating Temps from -40° to 100° C

Pg 84 Ø2.0”

Model 702

- 80 lb. Max. Radial and Axial Load
- Resolutions to 30,000 CPR
- Shaft Sizes to 0.375”, or 10 mm
- Operating Temps from -40° to 100° C
- Sealing Up to IP67

Pg 88 Ø2.5”

Model 25SP Programmable

- Programmable waveform, output type, and resolution
- Resolutions from 1 to 65,536 CPR (262,144 quadrature counts)
- 2.7 MHz max frequency
- Designed for industrial environments
- Sealing Up to IP67

Pg 92 Ø2.5”

Model 25SF

- Resolutions from 1 to 65,536 CPR (262,144 quadrature counts)
- 32 waveforms to choose from
- 6 different output types available
- 2.7 MHz max frequency
- Designed for industrial environments
- Sealing Up to IP67

Pg 94 Ø2.5”

Model 725

- Industrial Isolated Flex Housing Available
- Standard and Industrial Housing Available
- Resolutions to 30,000 CPR
- Operating Temps from -40° to 100° C
- Sealing Up to IP67

Pg 98 Ø58 mm

Model 758

- 80 lb. Max. Radial and Axial Load
- Resolutions to 30,000 CPR
- Clamping or Synchro Flange Options
- Operating Temps from -40° to 100° C
- Sealing Up to IP67

STAINLESS STEEL ENCODERS

Pg 100 Ø2.0”

Model 802S
- 2.0” Industrial 316 Stainless Steel Housing
- 80 lb. Max. Radial and Axial Load
- Resolutions to 30,000 CPR
- Shaft Sizes to 0.375”, or 10 mm
- Sealing Up to IP67

Pg 102 Ø58 mm

Model 858S
- 58 mm Industrial 316 Stainless Steel Housing
- 80 lb. Max. Radial and Axial Load
- Resolutions to 30,000 CPR
- Clamping or Synchro Flange Options
- Sealing Up to IP67

Pg 104 Ø6.5”

Model 865T
- Fits NEMA Frame Size 56C Thru 184C Motors
- Slim 1” Profile Housing in 316 Stainless Steel
- Resolutions to 4096 CPR
- Bore Sizes to 1.00”, or 24 mm
- Sealing Up to IP66 with Optional Cover

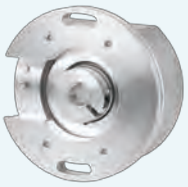
INCREMENTAL MODULE AND MODULAR ENCODERS

Pg 106 Ø30 mm

Model 30M
- Resolutions to 1024 CPR
- Optional 2, 4 or 8-pole commutation
- Sealing options to IP69K
- Temperature range -40° to 120° C

Pg 108 Ø30 mm

Model 30MT
- Resolutions to 1024 CPR
- Threaded housing
- Sealing options to IP69K
- Temperature range -40° to 120° C



Pg 112 Ø2.0”

Model 121
- Patented Auto Aligning Modular Encoder
- Up to 12 Pole Commutation Available
- Bore Sizes to 0.625”, or 15 mm
- Ideal for higher speed motor applications
- Resolutions to 2540 CPR

Call Sales & Customer Service at 800-366-5412
EPC is open for business from
8:00 am to 7:30 pm EST/ 5:00 am to 4:30 pm PST.

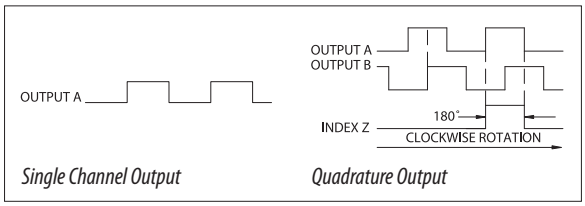
What is an encoder?

An encoder is a sensing device that provides feedback from the physical world – it converts motion to an electrical signal that can be read by some type of control device, such as a counter or PLC. The control device can then use that signal to control a conditional event, such as activating a print head to create a mark at a specific location.

Encoders use different types of technologies to create a signal. Some common encoder technologies are: mechanical, magnetic, resistive, and optical. Currently, the most common technology employed by encoders is optical.

Encoders may produce either incremental or absolute signals. Incremental signals do not indicate specific position, only that the position has changed. Absolute encoders, on the other hand, use a different "word" for each position, meaning that an absolute encoder provides both the indication that the position has changed and an indication of the absolute position of the encoder.

Incremental encoders are available in two basic output types, single channel and quadrature, shown below.

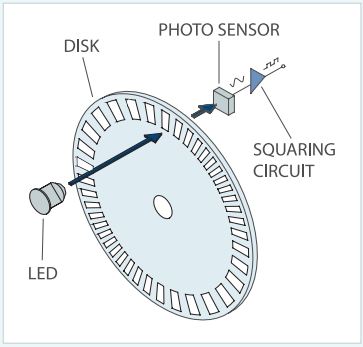


A single channel encoder, often called a tachometer, is normally used in systems that rotate in only one direction and require simple position and velocity information.

Quadrature encoders have dual channels (A and B), phased 90 electrical degrees apart. These two output signals determine the direction or rotation by detecting the leading or lagging signal in their phase relationship. Quadrature encoders provide very high speed bi-directional information for very complex motion control applications.

How an incremental encoder square wave is produced:

The inset diagram outlines the basic construction of an incremental encoder. A beam of light emitted from an LED passes through a transparent disk patterned with opaque lines. The light beam is picked up by a photodiode array, also known as a photosensor. The photosensor responds to the light beam, producing a sinusoidal wave form, which is transformed into a square wave or pulse train. This pulse signal is then sent to the counter or controller, which will then send the signal to produce the desired function.



The diagram is for a typical rotary encoder. Incremental encoders can provide a once-per-revolution pulse (often called the index, marker, or reference) that occurs at the same mechanical point of the encoder shaft revolution. This pulse is on a separate output channel (Z) from the signal channel or quadrature outputs. The index pulse is often used to position motion control applications to a known mechanical reference.

Resolution is a term used to describe the Cycles Per Revolution (CPR) for incremental encoders. Each incremental encoder has a defined number of cycles that are generated for each 360 degree revolution of the shaft. These cycles are monitored by a counter or motion controller and converted to counts for position or velocity control. The diagram shows how the whole encoder comes together.

If you still have questions as to how an **encoder works in your specific application, please call us. When you contact EPC, you talk to engineers and** encoder experts for your toughest encoder questions.

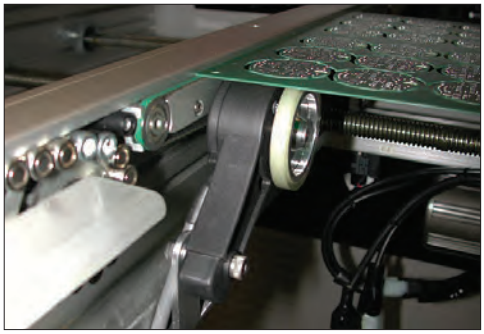
TYPICAL USAGE

Motor Feedback is the most common use for rotary encoders. In this type of application, an encoder is either mounted directly to the motor, or indirectly using a measuring wheel or chain-and-sprocket arrangement. The parameter of interest is primarily the speed of the motor.

Web Tensioning is an application in which the encoder is not usually mounted to the drive motor, but to one of the tensioning arm rollers. Any unevenness in the speed of this roller indicates that proper web tension is not being maintained and must be adjusted. The rotating speed of the tensioning roller is fed back to the controller, which then adjusts the drive motor so that web material is kept at an even tension.

Cut-to-Length is a very practical application of an encoder combined with simple mathematics. If, for example, a system were to be designed with a roller that is exactly one foot in circumference, the roller would feed one foot of material for every revolution of the roller. An encoder mounted to the roller would reflect this situation and could tell a controller how much material had been fed through the roller. The resolution of the encoder would also directly reflect the accuracy of the cut. In the above example, 96 CPR would yield cuts to an 1/8" accuracy.

Elevators are just one example where encoders can perform a dual role: they can determine the position of the elevator through a mathematical calculation; and they can determine the speed of travel of the elevator.



Registration Mark Timing uses encoders to determine the position of a unit relative to a known point, and then to determine the unit's speed relative to that mark. Radar antenna rotation is a good example of this type of application.

In Backstop Gauging, the encoder is used to make sure that the unit, typically a machine tool, does not exceed a pre-set position or direction of travel. Very often, this is combined with a determination of the speed of travel of the table, tool head, or similar component. Filling applications is just one example where Table Positioning is critical since the item being filled must arrive at filling tube at the same time the fluid control is turned on.

Conveying is another common industry where encoders are widely used. They may be attached to the motor, to intermediate axle shafts, or to both. Encoders are an especially effective feedback device where the positioning and/or speed of multi-element conveying systems must be carefully coordinated.

Spooling (sometimes referred to as Level Wind) is another application where encoders can prove invaluable. Not only is it necessary for the speed of the supply and take-up reels to be kept in proper relation to each other, but often the amount of material being spooled must also be tracked.

Electronics is just one industry that widely uses encoders in pick-and-place applications, where many of the capabilities of encoders (rate, position, speed, velocity) can often be found combined in a single system.

ENCODER SELECTION CONSIDERATIONS

Modular vs. Bearing Encoders

When deciding whether a modular or bearing encoder is the best solution for your application, consider these factors:

1. First and foremost, shaft end float and total indicated runout (TIR) must be within the encoder's specifications. This is so important that if you don't have (or can't get) this information, or don't trust what you have, an encoder with bearings is strongly recommended since it will be a much safer choice.

2. Modular encoders can be a good choice for high-speed applications – above 10,000 RPM – because there are no speed limitations dictated by encoder bearings. For example, EPC's Accu-Coder™ Model 121 Modular Encoder has been successfully operated at speeds in excess of 40,000 RPM. The speed limiting factor is the maximum frequency of the encoder (which is a function of disk resolution), RPMs, and the signal processing circuitry. Most encoder manufacturers include maximum frequency in product specifications.

3. If the motor is to be used under considerable mechanical load, where the motor bearings could experience extra wear, then an encoder with bearings would be the better choice. Remember, the bearings of the host device serve as the bearings of the modular encoder.

4. Modular encoders are difficult to seal. If your application requires washdown, or if the operating environment is dirty, dusty or wet, then an encoder with bearings and seals should be your first consideration. Such environments effectively rule out modular encoders, unless external protection, such as an IP sealed motor cover, is used.

5. If your application requirements combine high maximum frequency (> 200kHz), high temperature (100° C or higher), and higher resolution (> 2048 CPR), then an encoder with bearings is recommended. For long term reliability, this combination of factors requires the air-gap between the disk and sensor to be very narrow and tightly controlled. An encoder with bearings simply provides a more stable optical platform.

6. Lower resolutions (up to 1024 CPR) are more forgiving of end float and TIR, and are often well-suited for modular applications if the operating environment is appropriate.

7. If you plan to use numerous encoders, then the relatively lower price of a modular encoder could save you some money. On the other hand, the greater durability and easier installation of an encoder with bearings might be worth a slightly higher unit price. In any case, carefully weigh the factors of long term support costs versus lower acquisition costs before making your final decision.

Quick Selection Chart

Parameter	Attribute	Use Modular	Use Encoder with Bearings
Motor shaft end float and TIR	Within the encoder manufacturer's specifications	Yes	Yes
Motor shaft end float and TIR	Outside the encoder manufacturer's specifications	No	Yes
Motor shaft end float and TIR	Don't have the information or don't trust	Not suggested	Suggested
High-speed applications	Above 10,000 RPM	Good possibility	Not suggested
Severe duty application	Motor bearings have extra load and wear	Not suggested	Suggested
Dirty environment	May need seals	Not suggested	Suggested
Combination of high frequency response, temperature, CPR	> 200kHz, > 100° C, > 2048 CPR	Not suggested	Suggested
Lower resolution requirement	< 1024 cycles per revolution	Good possibility	Good
Number of units needed	Acquisition cost vs. life cycle cost	Consider if large volume	Good

INTRODUCTION TO ABSOLUTE ENCODERS

Absolute encoders differ from incremental encoders in how they report position information. Both types of encoders provide a signal to indicate a change mechanical position; however, where incremental encoders provide a series of pulses to indicate an incremental change in position as the shaft rotates, an absolute encoder provides a unique value indication of the position of the shaft. This allows an absolute encoder to report its exact position as soon as the system powers up, while an incremental encoder would need to return to a known position.

A selection of absolute encoders available from EPC

Absolute encoders provide position information for a rotating shaft within either a single rotation (single turn), or over the course of multiple rotations (multi-turn). The encoder provides a unique digital code or bit for each increment of shaft rotation. Multi-turn absolute encoders store turns-counting information for instant retrieval, even after power down. EPC offers both single turn and multi-turn absolute encoders with a variety of housing sizes, bore diameters, signal types and resolutions (see pages 10 - 25 for EPC's absolute encoder model options).

Advantages of EPC Absolute Encoders

- Remember position after a power outage, no need to re-home
- Typically have speed, scaling, preset, and fieldbus functions
- Allow you to determine the exact position of a machine and control over the storage of electronic data
- Multiple interface options: Parallel, Synchronous Serial Interface (SSI), CANopen, and EtherCAT
- Single turn and multi-turn options available, with resolution up to 16 Bit for Single Turn and 43 Bit for Multi-Turn
- Maintenance-free and environmentally friendly all-magnetic design
- Energy harvesting magnetic multi-turn technology – no gears or batteries
- Meet CE/EMC standards for immunity and emissions

When to Use Absolute Encoders

There are certain considerations that would suggest the use of an absolute encoder rather than an incremental encoder. These considerations include, but are not limited to:

- Connectivity. When you need your encoders to communicate over a network, absolute encoders offer more communication protocol options.
- Electrical Noise. Absolute encoders are more resistant to electrical noise.
- Reliability of Power Supply. If your application is subject to power loss, an absolute encoder is a better choice because it will retain its position after a power-off scenario.

If you have questions about using an absolute encoder, call our Technical Services Department. You'll talk to real engineers who understand absolute feedback in motion control, and will help you find the right encoder solution for your application.

MODEL A58HE

FEATURES
Single/Multi-Turn Absolute Encoder (16 Bit ST / 43 Bit MT)
EtherCAT with CoE, FoE, EoE
Maintenance-Free and Environmentally Friendly Magnetic Design
Energy Harvesting Magnetic Multi-Turn Technology
No Gears or Batteries
Electronic Cam Switches
Low TCO and easy provisioning with internal web server
Color LEDs for operating condition, bus status, link activity
Compact design with bus cover
58 mm (2.28") Diameter Package

COMMON APPLICATIONS
Robotics, Telescopes, Antennas, Medical Scanners, Wind Turbines, Elevators, Lifts, Motors, Automatic Guided Vehicles, Rotary and X/Y Positioning Tables

EPC Absolute Encoder – now with EtherCAT connectivity

The Model A58HE is an EtherCAT-ready, multi-turn absolute encoder designed for harsh factory and plant environments. It is particularly suited to applications where Ethernet-based connectivity is required, and the encoder must retain position information after power-off events. Easily designed into a wide variety of system applications, the Model A58HE plugs directly into your network with minimal provisioning for rapid deployment, facilitating data exchange among myriad networked devices. The Model A58HE retains absolute position information even after a power loss, facilitating speedy system recovery at start-up without the need for system re-homing.

Ready for Industry 4.0 and for the Industrial Internet of Things (IIoT), data exchange between the Model A58HE and other applications has no influence on the control loop. The Model A58HE is non-reactive and can work independently from the PLC or master, transferring data through network gateways to other automation networks and sites, and up to the cloud for analysis.

MODEL A58HE ORDERING GUIDE

Blue type indicates price adder options.

		Mechanical			Electrical							
A58HE	–	06	SR	–	16	00	EC	U	B	V4	–	RNB

MODEL
A58HE Absolute Series Hollow Bore (Blind)

BORE SIZE
06 6 mm
07 7 mm
08 8 mm
10 10 mm
12 12 mm
14 14 mm
15 15 mm
A5 0.250", 1/4"
A9 0.375", 3/8"

MOUNTING TYPE
SR 63 mm BC 2-pt. Flex Mount

SINGLE TURN RESOLUTION
01 to 16 Bit

MULTI-TURN RESOLUTION
00 Single Turn
01 to 43 Multi-Turn

COMM PROTOCOL
EC EtherCAT

SOFTWARE REV
U Revison U

OUTPUT CODE
B Binary

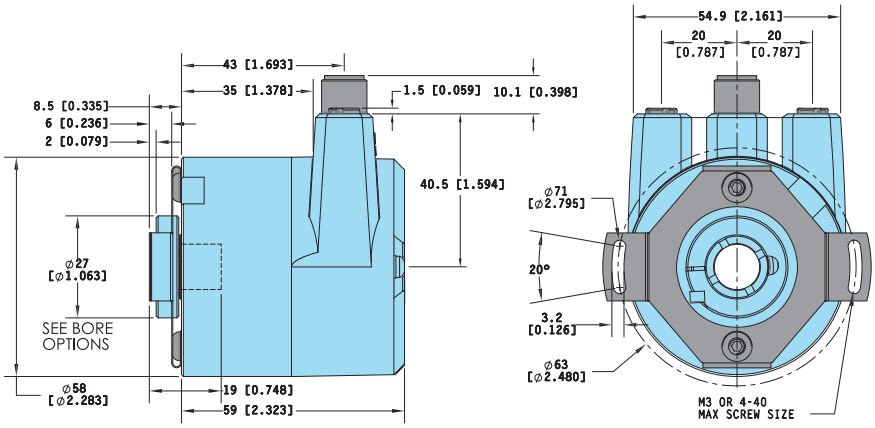
VOLTAGE
V4 10V - 32V

CONNECTOR TYPE[1]
RNB RNB Bus Cover with 3xM12

EtherCAT (Ethernet for Control and Automation Technology) is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

NOTES:
1 For mating connectors, cables, and cordsets see Accessories at encoder.com.

MODEL A58HE 63 MM 2 PT. FLEX MOUNT (SR)



Primary dimensions are in mm, secondary dimensions SI units [inches] in brackets for reference only.

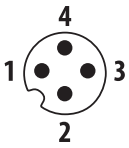
NETWORK BUS CONNECTOR PINOUT

Bus cover with 3x M12x1. For EPC-supplied mating cables, wiring table is provided with cable. Trim back and insulate unused wires.

Port 1 (In)

Assignments	
RNB	
	
Female Connector (Port1) IN	M12x1, 4-pin, D-coded
Tx+	1
Rx+	2
Tx-	3
Rx-	4

Power

Assignments	
RNB	
	
Connector (Power)	M12x1, 4-pin, A-coded
(+) Vcc	1
n. c.	2
GND	3
n. c.	4

Port 2 (Out)

Assignments	
RNB	
	
Female Connector (Port2) OUT	M12x1, 4-pin, D-coded
Tx+	1
Rx+	2
Tx-	3
Rx-	4

MODEL A58HE SPECIFICATIONS

Electrical

Power Supply ..... 10 VDC up to 32 VDC
Current Consumption..... typ. 125 mA
Power Consumption..... typ. 3 W

Sensor Specification

Internal Cycle Time .. 50 µs
Resolution
- Single Turn ..... up to 65,536 steps/360° (16 bit)
- Multi-Turn..... 43 bit

Accuracy
- Single Turn ..... ± 0.0878° (≤ 12 bit)
- Single Turn, Repeat Accuracy..... ± 0.0878° (≤ 12 bit)

Technology
- Single Turn ..... Innovative Hall-sensor technology
- Multi-Turn..... Patented energy-harvesting technology, no battery and no gears

Turn on time ..... < 1.5 s

Interface

Interface..... Industrial Ethernet
Protocol..... EtherCAT
Device Profile..... CiA DS-406 V4.0.2, Class 3
Data Transfer..... 100BASE-TX
Cycle time..... up to 50 µs
Code ..... Binary, CW default, programmable
Programmable ..... Steps per revolution; counts of revolution; preset; scale; counting direction; 2x 8 cam switches; DC-Mode
Parameter
Diagnostic LED ..... Traffic and connection management: L/A1: Port 1 (IN) L/A2: Port 2 (OUT)
Status LED ..... STAT, MOD: status of encoder and bus

Mechanical

Flange..... Hollow bore (blind bore)
Flange Material..... Aluminum
Shaft Material ..... Stainless steel
Shaft Length..... 17 mm
Insertion depth
- min ..... 10 mm
- max ..... 19 mm

Housing Cap..... Steel case chrome-plated, magnetic shielding
Connection Cover .... Die cast aluminum, powder coated
Weight..... 14.4 oz / 410 g approx
Shaft Rotation ..... Bi-directional
Max Radial Shaft Load ..... 80 N (17.9 lb)
Max Axial Shaft Load ..... 50 N (11.2 lb)
Starting Torque ..... Approximately 1.6 Ncm (2.226 oz-in) at ambient temperature.
Max Shaft Speed..... 6000 RPM

Bearings

Type..... 2 precision ball bearings
Nominal Service Life..... 1 x 10^9 revs. at 100% rated shaft load
1 x 10^{10} revs. at 40% rated shaft load
1 x 10^{11} revs. at 20% rated shaft load

Environmental

Operating Temp ..... -40° to 85° C
Storage Temp ..... -40° to 100° C
Sealing..... IP65 tested per EN 60529
ESD ..... 8 kV tested per EN 61000-4-2
Burst..... 2 kV tested per 61000-4-4
EMC..... EN 61000-6-2; EN 61000-6-3
Vibration..... 200 m/s^2 (10 Hz up to 1000 Hz) (20.3 g [10Hz up to 1000 Hz]) tested per EN 60068-2-6
Shock..... 5000 m/s^2 (6 ms) 509.8 g (6 ms) tested per EN 60068-2-27
Design..... According DIN VDE 0160

MODEL A58SE

FEATURES
Single/Multi-Turn Absolute Encoder (16 Bit ST / 43 Bit MT)
EtherCAT with CoE, FoE, EoE
Maintenance-Free and Environmentally Friendly Magnetic Design
Energy Harvesting Magnetic Multi-Turn Technology
No Gears or Batteries
Electronic Cam Switches
Low TCO and easy provisioning with internal web server
High Shaft Load
Color LEDs for operating condition, bus status, link activity
Compact design with bus cover
58 mm (2.28") Diameter Package

COMMON APPLICATIONS
Robotics, Telescopes, Antennas, Medical Scanners, Wind Turbines, Elevators, Lifts, Motors, Automatic Guided Vehicles, Rotary and X/Y Positioning Tables

EPC Absolute Encoder – now with EtherCAT connectivity

The Model A58SE is an EtherCAT-ready, multi-turn absolute encoder designed for harsh factory and plant environments. It is particularly suited to applications where Ethernet-based connectivity is required, and the encoder must retain position information after power-off events. Easily designed into a wide variety of system applications, the A58SE plugs directly into your network with minimal provisioning for rapid deployment, facilitating data exchange among myriad networked devices. The Model A58SE retains absolute position information even after a power loss, facilitating speedy system recovery at start-up without the need for system re-homing.

Ready for Industry 4.0 and for the Industrial Internet of Things (IIoT), data exchange between the Model A58SE and other applications has no influence on the control loop. The Model A58SE is non-reactive and can work independently from the PLC or master, transferring data through network gateways to other automation networks and sites, and up to the cloud for analysis.

MODEL A58SE ORDERING GUIDE

Blue type indicates price adder options.

Mechanical | Electrical

A58SE	–	06	MH	–	16	00	EC	U	B	V4	–	RNB

MODEL
A58SE Absolute Series

SHAFT SIZE
06 6 mm[1]
08 8 mm[1]
10 10 mm[2]
A9 0.375", 3/8"[1]

MOUNTING TYPE
MH Clamping Flange
MK Synchro Flange

SINGLE TURN RESOLUTION
01 to 16 Bit

MULTI-TURN RESOLUTION
00 Single Turn
01 to 43 Multi-Turn

COMM PROTOCOL
EC EtherCAT

SOFTWARE REV
U Revison U

OUTPUT CODE
B Binary

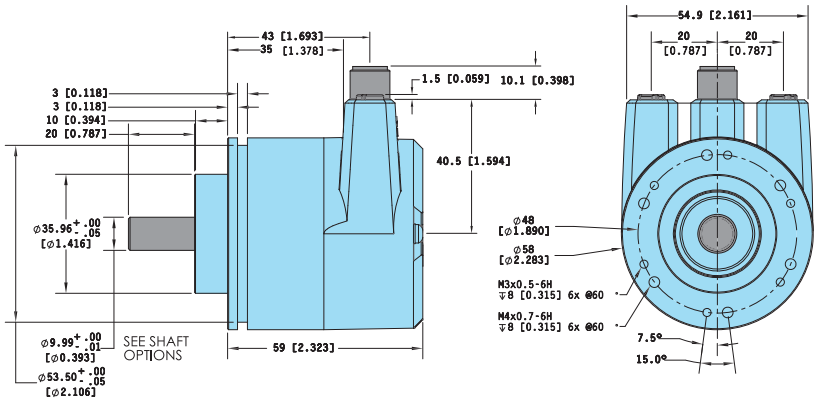
VOLTAGE
V4 10V - 32V

CONNECTOR TYPE[3]
RNB RNB Bus Cover with 3xM12

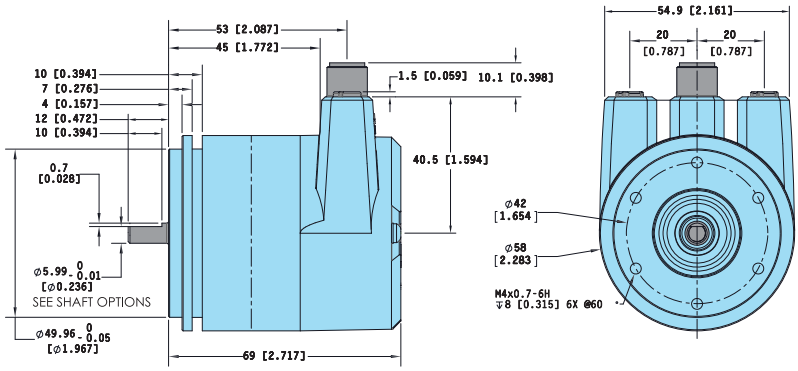
EtherCAT (Ethernet for Control and Automation Technology) is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

NOTES:
1 Available with IP65 seal only.
2 Available with IP67 seal only.
3 For mating connectors, cables, and cordsets see Accessories at encoder.com.

MODEL A58SE CLAMPING FLANGE (MH)



MODEL A58SE SYNCHRO FLANGE (MK)



Primary dimensions are in mm, secondary dimensions SI units [inches] in brackets for reference only.

Please see the Model A58HE, page 11, for Pinout Diagram.

MODEL A58SE SPECIFICATIONS

Electrical

Power Supply ..... 10 VDC up to 32 VDC
Current Consumption..... typ. 125 mA
Power Consumption..... typ. 3 W

Sensor Specification

Internal Cycle Time .. 50 µs
Resolution
- Single Turn ..... up to 65,536 steps/360° (16 bit)
- Multi-Turn ..... 43 bit

Accuracy
- Single Turn ..... ± 0.0878° (≤ 12 bit)
- Single Turn, Repeat Accuracy..... ± 0.0878° (≤ 12 bit)

Technology
- Single Turn ..... Innovative Hall-sensor technology
- Multi-Turn ..... Patented energy-harvesting technology, no battery and no gears

Turn on time ..... < 1.5 s

Interface

Interface ..... Industrial Ethernet
Protocol ..... EtherCAT
Device Profile ..... CiA DS-406 V4.0.2, Class 3
Data Transfer 100BASE-TX
Cycle time..... up to 50 µs
Code ..... Binary, CW default, programmable
Programmable Parameter ..... Steps per revolution; counts of revolution; preset; scale; counting direction; 2x 8 cam switches; DC-Mode
Diagnostic LED ..... Traffic and connection management: L/A1: Port 1 (IN) L/A2: Port 2 (OUT)
Status LED ..... STAT, MOD: status of encoder and bus

Mechanical

Flange ..... Synchro or Clamping
Flange Material ..... Aluminum
Shaft Material ..... Stainless steel
Shaft Length ..... 17 mm
Insertion depth
- min ..... 10 mm
- max ..... 19 mm

Housing Cap ..... Steel case chrome-plated, magnetic shielding
Connection Cover .... Die cast aluminum, powder coated
Weight ..... 16 oz / 450 g approx
Shaft Rotation ..... Bi-directional
Max Radial Shaft Load ..... 125 N (28.1 lb) for 6 mm and 8 mm shafts
220 N (49.4 lb) for 10 mm shaft
220 N (49.4 lb) for 3/8" shaft
Max Axial Shaft Load ..... 120 N (26.9 lb) for 6 mm, 8 mm and 10 mm shafts
120 N (26.9 lb) for 3/8" shaft
Starting Torque ..... Approximately 1 Ncm (1.416 oz-in) at ambient temperature.
Max Shaft Speed..... 6000 RPM

Bearings

Type ..... 2 precision ball bearings
Nominal Service Life ..... 1×10^9 revs. at 100% rated shaft load
1×10^{10} revs. at 40% rated shaft load
1×10^{11} revs. at 20% rated shaft load

Environmental

Operating Temp ..... -40° to 85° C
Storage Temp ..... -40° to 100° C
Sealing ..... IP65 (IP67 on 10 mm shaft) tested per EN 60529
ESD ..... 8 kV tested per EN 61000-4-2
Burst ..... 2 kV tested per 61000-4-4
EMC ..... EN 61000-6-2; EN 61000-6-3
Vibration ..... 200 m/s^2 (10 Hz up to 1000 Hz) (20.3 g [10Hz up to 1000 Hz]) tested per EN 60068-2-6
Shock ..... 5000 m/s^2 (6 ms)
509.8 g (6 ms)
tested per EN 60068-2-27
Design ..... According DIN VDE 0160

MODEL A36HB

CANopen

SSI
Synchronous Serial Interface

Ø36 mm

FEATURES

Single Turn/Multi-Turn Absolute Encoder (16 Bit ST / 43 Bit MT)
SSI or CANopen Communication
Maintenance-Free and Environmentally Friendly Magnetic Design
Energy Harvesting Magnetic Multi-Turn Technology
No Gears or Batteries
Standard Size 36 mm (1.42") Hollow Bore (Blind) Encoder
Flex Mount Eliminates Couplings and Is Ideal for Motors or Shafts
Meets CE/EMC Standards for Immunity and Emissions

The Model A36HB Absolute Encoder offers a high performance solution for your absolute feedback needs. It provides maintenance-free feedback thanks to its innovative battery-free and gear-free multi-turn technology. This encoder is especially suited for applications where position information must be retained after loss of system power. Its rugged magnetic technology and high IP rating make the Model A36HB an excellent choice, even in tough industrial environments. Available with a 1/4" or 6 mm hollow bore (blind) and a wide selection of flexible mounting options, the Model A36HB is easily designed into a variety of applications.

COMMON APPLICATIONS

Robotics, Telescopes, Antennas, Medical Scanners, Wind Turbines, Elevators, Lifts, Motors, Automatic Guided Vehicles, Rotary and X/Y Positioning Tables

MODEL A36HB ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Mechanical | Electrical

A36HB	–	06	SF	–	12	10	CO	A	B	V4	–	AMJ

MODEL
A36HB Absolute Series Hollow Bore (Blind)

BORE SIZE
06 6 mm
A5 1/4", 0.250"

MOUNTING
SF 1.812" (46 mm) Slotted Flex Mount
SD 1.575" (40 mm) Slotted Flex Mount
SW 1.653" (42 mm) Slotted Flex Mount

SINGLE TURN RESOLUTION
01 to 16 Bit

MULTI-TURN RESOLUTION
00 Single Turn
01 to 43 Multi-Turn

COMM PROTOCOL
CO CANopen[1]
SI SSI[2]

SOFTWARE REV
A Revision A

OUTPUT CODE
B Binary
G Gray[3]

INPUT VOLTAGE
5 5 VDC[3]
V4 10 to 32 VDC

CONNECTOR TYPE[4]
AMJ 5-pin M12 Axial Mount[5]
AMK 8-pin M12 Axial Mount[3]
AC6 6-foot Axial Mount Cable[3]
RC6 6-foot Radial Mount Cable[3]

NOTES:
1 Please refer to *CANopen Interface Technical Reference Manual* at encoder.com.
2 Please refer to Technical Bulletin *TB-529: Understanding EPC's SSI Encoders* at encoder.com.
3 Available with SSI only.
4 For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
5 Available with CANopen only.

MODEL A36HB SPECIFICATIONS

Electrical

Input Voltage..... 10 to 32 VDC max SSI or CANopen
5 VDC SSI Only
Input Current ..... 50 mA typical for 10 to 32 VDC
80 mA typical for 5 VDC
Power Consumption... 0.5 W max
Resolution (Single) ... 01 to 16 bit
Resolution (Multi) .... 01 to 43 bit
Accuracy..... ± 0.35°
Repeatability ..... ± 0.2°
CE/EMC ..... Immunity tested per EN 61000-6-2:2006
Emissions tested per EN 61000-6-3:2011

CANopen Interface

Protocol..... CANopen:
Communication profile CiA 301
Device profile for encoder CiA 406 V3.2
class C2
Node Number ..... 0 to 127 (default 127)
Baud Rate..... 10 Kbaud to 1 Mbaud with automatic bit rate detection

Note: The standard settings, as well as any customization in the software, can be changed via LSS (CiA 305) and the SDO protocol (e.g., PDOs, scaling, heartbeat, node-ID, baud rate, etc.).

Programmable CANopen Transmission Modes

Synchronous..... When a synchronization telegram (SYNC) is received from another bus node, PDOs are transmitted independently.
Asynchronous..... A PDO message is triggered by an internal event (e.g., change of measured value, internal timer, etc.).

SSI Interface

Clock Input ..... Via opto coupler
Clock Frequency..... 100KHz to 500KHz. Higher frequencies may be available. Contact Customer Service.
Data Output ..... RS485 / RS422 compatible
Output Code ..... Gray or binary
SSI Output ..... Angular position value
Parity Bit..... Optional (even/odd)
Error Bit..... Optional
Turn On Time ..... < 1.5 sec
Pos. Counting Dir..... Connect DIR to GND for CW
Connect DIR to VDC for CCW
(when viewed from shaft end)
Set to Zero..... Yes, see Technical Bulletin ***TB-529: Understanding EPC's SSI Encoders***
Protection ..... Galvanic Isolation

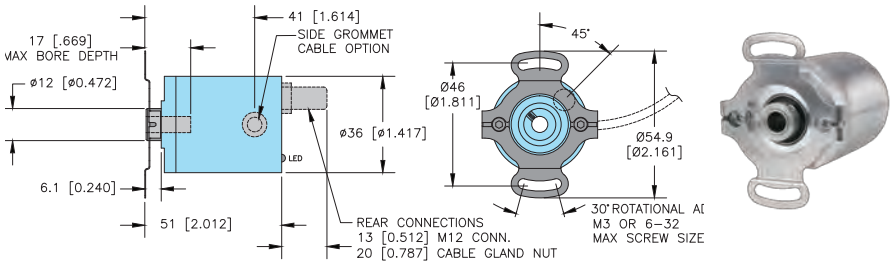
Mechanical

Max Shaft Speed..... 12,000 RPM
Bore Depth..... 17 mm (0.669")
User Shaft
Radial Runout..... 0.005" max
Starting Torque ..... < 0.45 oz-in typical
Radial Shaft Load ..... 17 lb (80 N) = bearing life of $1.4x10^8$ revolutions
Axial Shaft Load ..... 11 lb (50 N) = bearing life of $1.4x10^8$ revolutions
Housing ..... Ferrous chrome-plated magnetic screening
Weight..... 5 oz typical

Environmental

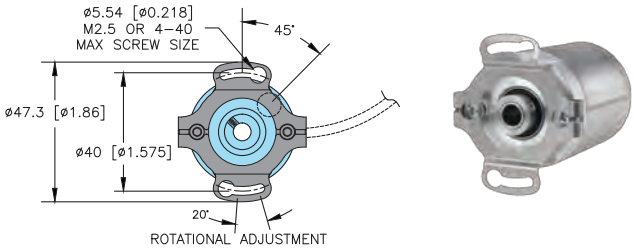
Operating Temp ..... -40° to 85° C
Storage Temp ..... -40° to 100° C
Humidity..... 95% RH non-condensing
Vibration..... 5 g @ 10 to 2000 Hz
Shock..... 100 g @ 6 ms duration
Sealing..... IP67; shaft sealed to IP65

MODEL A36HB 1.812" (46 MM) SLOTTED FLEX MOUNT (SF)

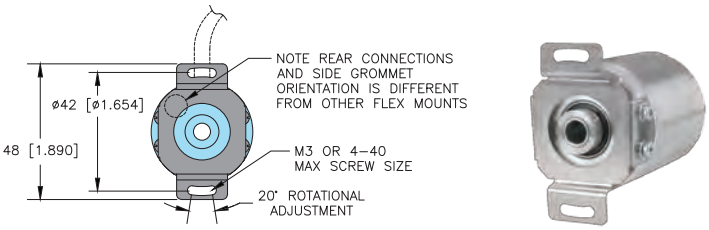


MODEL A36HB OPTIONAL FLEX MOUNTS

1.575" (40 mm) SD



1.653" (42 mm) SW



Primary dimensions are in mm, secondary dimensions SI units [inches] in brackets for reference only.

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.
For CE (Conformity European) requirements, use M12 cordset with shield connected to M12 coupling nut.
Trim back and insulate unused wires.

SSI ENCODERS

Function	Gland Cable† Wire Color	8-pin M-12
Ground (GND)	White	1
+VDC	Brown	2
SSI CLK+	Green	3
SSI CLK-	Yellow	4
SSI DATA+	Gray	5
SSI DATA-	Pink	6
PRESET	Blue	7
DIR	Red	8
Shield	Side - Exit Housing End - Exit N/C	Housing

†Standard cable is 24 AWG conductors with foil and braid shield.

CANOPEN ENCODERS

Function	Pin
+VDC	2
Ground (GND)	3
CAN $_{High}$	4
CAN $_{Low}$	5
CAN $_{GND}$ / Shield	1

MODEL A36SB

Ø36 mm

FEATURES

Single Turn/Multi-Turn Absolute Encoder (16 Bit ST / 43 Bit MT)
SSI or CANopen Communication
Maintenance-Free and Environmentally Friendly Magnetic Design
Energy Harvesting Magnetic Multi-Turn Technology
No Gears or Batteries
Standard Size 36 mm Package (1.42")
Meets CE/EMC Standards for Immunity and Emissions

The Model A36SB Absolute Encoder offers a high performance solution for your absolute feedback needs. It provides maintenance-free feedback thanks to its innovative battery-free and gear-free multi-turn technology. This encoder is especially suited for applications where position information must be retained after loss of system power. Its rugged magnetic technology and high IP rating make the Model A36SB an excellent choice, even in tough industrial environments. Available with a 1/4" or 6 mm shaft and a servo mount, the Model A36SB is easily designed into a variety of applications.

COMMON APPLICATIONS

Robotics, Telescopes, Antennas, Medical Scanners, Wind Turbines, Elevators, Lifts, Motors, Automatic Guided Vehicles, Rotary and X/Y Positioning Tables

MODEL A36SB ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Mechanical | Electrical

A36SB	–	06	MB	–	12	10	CO	A	B	V4	–	AMJ

MODEL
A36SB Absolute Series

SHAFT SIZE
06 6 mm
A5 1/4", 0.250"

MOUNTING
MB 36 mm Servo Mount

SINGLE TURN RESOLUTION
01 to 16 Bit

MULTI-TURN RESOLUTION
00 Single Turn
01 to 43 Multi-Turn

COMM PROTOCOL
CO CANopen[1]
SI SSI[2]

SOFTWARE REV
A Revison A

OUTPUT CODE
B Binary
G Gray[3]

INPUT VOLTAGE
5 5 VDC[3]
V4 10 to 32 VDC

CONNECTOR TYPE[4]
AMJ 5-pin M12 Axial Mount[5]
AMK 8-pin M12 Axial Mount[3]
AC6 6-foot Axial Mount Cable[3]
RC6 6-foot Radial Mount[3]

NOTES:
1 Please refer to *CANopen Interface Technical Reference Manual* at encoder.com.
2 Please refer to Technical Bulletin *TB-529: Understanding EPC's SSI Encoders* at encoder.com.
3 Available with SSI only.
4 For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
5 Available with CANopen only.

MODEL A36SB SPECIFICATIONS

Electrical

Input Voltage..... 10 to 32 VDC max SSI or CANopen
5 VDC SSI Only
Input Current ..... 50 mA typical for 10 to 32 VDC
80mA typical for 5 VDC

Power Consumption .. 0.5 W max
Resolution (Single).... 01 to 16 bit
Resolution (Multi)..... 01 to 43 bit
Accuracy..... ± 0.35°
Repeatability ..... ± 0.2°
CE/EMC ..... Immunity tested per EN 61000-6-2:2006
Emissions tested per EN 61000-6-3:2011

CANopen Interface

Protocol..... CANopen:
Communication profile CiA 301
Device profile for encoder CiA 406 V3.2 class C2
Node Number ..... 0 to 127 (default 127)
Baud Rate..... 10 Kbaud to 1 Mbaud with automatic bit rate detection

Note: The standard settings as well as any customization in the software can be changed via LSS (CiA 305) and the SDO protocol (e.g., PDOs, scaling, heartbeat, node-ID, baud rate, etc.)

Programmable CANopen Transmission Modes

Synchronous..... When a synchronization telegram (SYNC) is received from another bus node, PDOs are transmitted independently.
Asynchronous..... A PDO message is triggered by an internal event (e.g., change of measured value, internal timer, etc.)

SSI Interface

Clock Input ..... via opto coupler
Clock Frequency..... 100 KHz to 500 KHz. Higher frequencies may be available. Contact Customer Service.
Data Output ..... RS485 / RS422 compatible
Output Code ..... Gray or binary
SSI Output ..... Angular position value
Parity Bit..... Optional (even/odd)
Error Bit..... Optional
Turn On Time ..... < 1.5 sec
Pos. Counting Dir..... Connect DIR to GND for CW
Connect DIR to VDC for CCW
(when viewed from shaft end)
Set to Zero..... Yes, see Technical Bulletin ***TB-529: Understanding EPC's SSI Encoders***
Protection ..... Galvanic Isolation

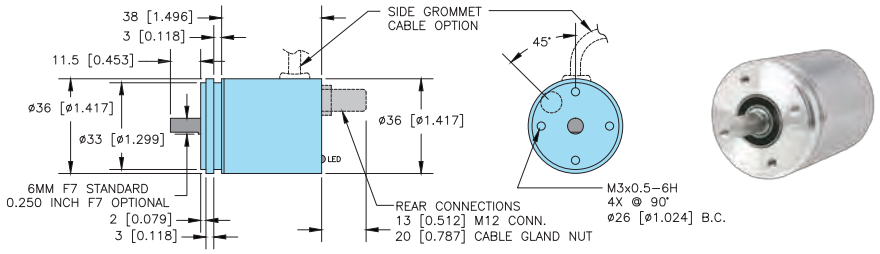
Mechanical

Max Shaft Speed..... 12,000 RPM
Radial Shaft Load ..... 17 lb (80 N) = bearing life of $1.4x10^8$ revolutions
Axial Shaft Load ..... 11 lb (50 N) = bearing life of $1.4x10^8$ revolutions
Starting Torque ..... < 0.45 oz-in typical
Housing ..... Ferrous chrome-plated magnetic screening
Weight..... 5 oz typical

Environmental

Operating Temp ..... -40° to 85° C
Storage Temp ..... -40° to 100° C
Humidity..... 95% RH non-condensing
Vibration..... 5 g @ 10 to 2000 Hz
Shock..... 100 g @ 6 ms duration
Sealing..... IP67; shaft sealed to IP65

MODEL A36SB SOLID SHAFT



Primary dimensions are in mm, secondary dimensions SI units [inches] in brackets for reference only.

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.
For CE (Conformity European) requirements, use M12 cordset with shield connected to M12 coupling nut. Trim back and insulate unused wires.

SSI ENCODERS

Function	Gland Cable† Wire Color	8-pin M-12
Ground (GND)	White	1
+VDC	Brown	2
SSI CLK+	Green	3
SSI CLK-	Yellow	4
SSI DATA+	Gray	5
SSI DATA-	Pink	6
PRESET	Blue	7
DIR	Red	8
Shield	Side - Exit Housing End - Exit N/C	Housing

†Standard cable is 24 AWG conductors with foil and braid shield.

CANOPEN ENCODERS

Function	Pin
+VDC	2
Ground (GND)	3
CAN_{High}	4
CAN_{Low}	5
CAN_{GND} / Shield	1

MODEL A58HB

CANopen

SSI
Synchronous Serial Interface

Ø58 mm

FEATURES

Single Turn/Multi-Turn Absolute Encoder (16 Bit ST / 43 Bit MT)
SSI or CANopen Communication
Maintenance-Free and Environmentally Friendly All-Magnetic Design
Energy Harvesting Magnetic Multi-Turn Technology
No Gears or Batteries
58 mm (2.28”) Diameter Hollow Bore (Blind) Encoder
Flex Mount Eliminates Couplings and Is Ideal for Motors or Shafts
Meets CE/EMC Standards for Immunity and Emissions

The Model A58HB Absolute Encoder offers a high performance solution for your absolute feedback needs. It provides maintenance-free feedback thanks to its innovative battery-free and gear-free multi-turn technology. This encoder is especially suited for applications where position information must be retained after loss of system power. Its rugged magnetic technology and high IP rating make the Model A58HB an excellent choice, even in tough industrial environments. Available with bores up to 3/8" or 14 mm and two flexible mounting options, the Model A58HB is easily designed into a variety of applications.

COMMON APPLICATIONS

Robotics, Telescopes, Antennas, Medical Scanners, Wind Turbines, Elevators, Lifts, Motors, Automatic Guided Vehicles, Rotary and X/Y Positioning Tables

MODEL A58HB ORDERING GUIDE

Blue type indicates price adder options.

Mechanical | Electrical

A58HB – 06 SQ – 14 18 CO A B V4 – RMJ

MODEL
A58HB Absolute Series Hollow Bore (Blind)

BORE SIZE
06 6 mm
07 7 mm
08 8 mm
10 10 mm
12 12 mm
14 14 mm
A5 0.250”, 1/4"
A9 0.375”, 3/8”

MOUNTING TYPE
SQ 108 mm BC Flex Arm
SR 63 mm BC 2-pt. Flex Mount

SINGLE TURN RESOLUTION
01 to 16 Bit

MULTI-TURN RESOLUTION
00 Single Turn
01 to 43 Multi-Turn

COMM PROTOCOL
CO CANopen[1]
SI SSI[2]

SOFTWARE REV
A Revison A

OUTPUT CODE
B Binary
G Gray[3]

INPUT VOLTAGE
5 5 VDC[3]
V4 10 to 32 VDC

CONNECTOR TYPE[4]
RMJ 5-pin M12 Radial Mount[5]
RMK 8-pin M12 Radial Mount[3]

NOTES:
1 Please refer to *CANopen Interface Technical Reference Manual* at encoder.com.
2 Please refer to Technical Bulletin *TB-529: Understanding EPC’s SSI Encoders* at encoder.com.
3 Available with SSI only.
4 For mating connectors, cables, and cordsets see Accessories at encoder.com.
For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
5 Available with CANopen only.

MODEL A58HB SPECIFICATIONS

Electrical

Input Voltage..... 10 to 32 VDC max
5 VDC SSI Only
Input Current ..... 50 mA typical for 10 to 32 VDC
80 mA typical for 5 VDC

Power: Consumption.. 0.5 W max
Resolution (Single) ... 01 to 16 bit
Resolution (Multi) .... 01 to 43 bit
Accuracy..... <± 0.35°
Repeatability ..... <± 0.2°
CE/EMC ..... Immunity tested per EN 61000-6-2:2006
Emissions tested per EN 61000-6-3:2011

CANopen Interface

Protocol..... CANopen:
Communication profile CiA 301
Device profile for encoder CiA 406 V3.2 class C2
Node Number ..... 1 to 127 (default 127)
Baud Rate..... 10 Kbaud to 1 Mbaud with automatic bit rate detection

Note: The standard settings, as well as any customization in the software, can be changed via LSS (CiA 305) and the SDO protocol (e.g., PDOs, scaling, heartbeat, node-ID, baud rate, etc.).

Programmable CANopen Transmission Modes

Synchronous..... When a synchronization telegram (SYNC) is received from another bus node, PDOs are transmitted independently.
Asynchronous..... A PDO message is triggered by an internal event (e.g., change of measured value, internal timer, etc.).

SSI Interface

Clock Input ..... Via opto-coupler
Clock Frequency..... 100 kHz to 500 kHz. Higher frequencies may be available. Contact Customer Service.
Data Output ..... RS485 / RS422 compatible
Output Code ..... Gray or binary
SSI Output ..... Angular position value
Parity Bit..... Optional (even/odd)
Error Bit..... Optional
Turn On Time ..... < 1.5 sec
Pos. Counting Dir..... Connect DIR to GND for CW
Connect DIR to VDC for CCW
(when viewed from shaft end)
Set to Zero..... Yes, see Technical Bulletin TB529: *Understanding EPC's SSI Encoders*
Protection ..... Galvanic Isolation with SSI option

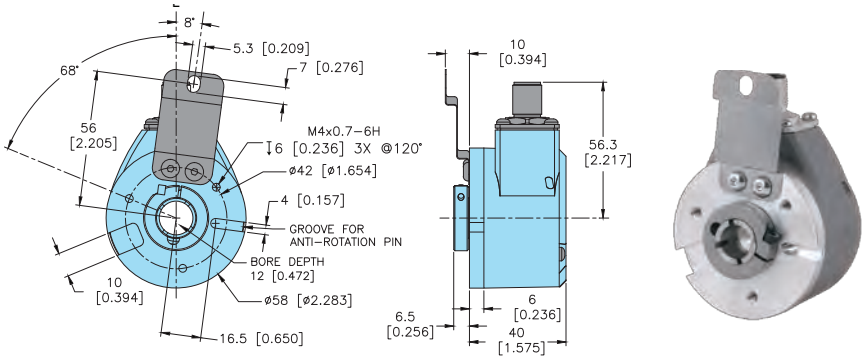
Mechanical

Max Shaft Speed..... 6000 RPM
Shaft Rotation ..... Bi-directional
Radial Run-out ..... 0.007" max
Axial Endplay..... ± 0.030" max
Radial Shaft Load ..... 17 lb (80 N) = bearing life of $1x10^9$ revolutions
Axial Shaft Load ..... 11 lb (50 N) = bearing life of $1x10^9$ revolutions
Starting Torque ..... 2.3 oz-in typical
Housing ..... All metal with protective finish
Bearings..... 2 precision ball bearings
Weight..... 7.5 oz typical

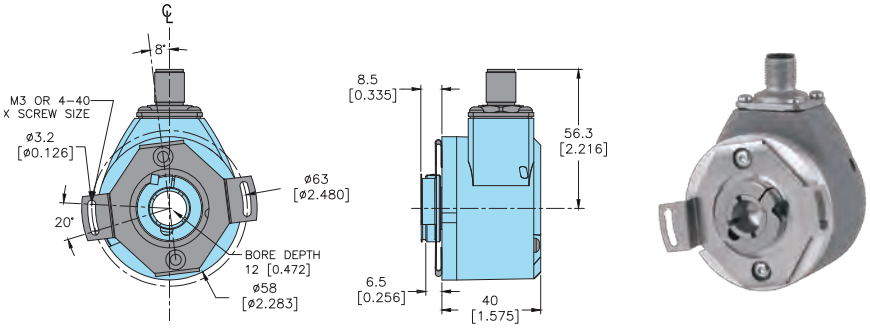
Environmental

Operating Temp ..... -40° to 85° C
Storage Temp ..... -40° to 100° C
Vibration..... 5.1 g (10 Hz up to 2000 Hz)
Shock..... 100 g (6 ms)
Sealing..... IP67, shaft sealed to IP65

MODEL A58HB 108 MM BC FLEX ARM (SQ)



MODEL A58HB 63 MM 2 PT. FLEX MOUNT (SR)



Primary dimensions are in mm, secondary dimensions SI units [inches] in brackets for reference only.

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.

For CE (Conformity European) requirements, use M12 cordset with shield connected to M12 coupling nut.

Trim back and insulate unused wires.

SSI ENCODERS

Function	8-Pin M12
Ground (GND)	1
+VDC	2
SSI CLK+	3
SSI CLK-	4
SSI DATA+	5
SSI DATA-	6
PRESET	7
DIR	8
Shield	Housing

CANopen ENCODERS

Function	5-Pin M12
+VDC	2
Ground (GND)	3
CAN_{HIGH}	4
CAN_{LOW}	5
CAN_{GND} / Shield*	1

*M12 connector is connected to encoder housing.

MODEL A25SB

CANopen

SSI
Synchronous Serial Interface

Ø2.5"

FEATURES

Single Turn/Multi-Turn Absolute Encoder (16 Bit ST / 43 Bit MT)
SSI or CANopen Communication
Maintenance-Free and Environmentally Friendly Magnetic Design
Energy Harvesting Magnetic Multi-Turn Technology
No Gears or Batteries
IP67 Sealing Available
Servo and Flange Mounting
Standard Size 25 Package (2.5" x 2.5")
Meets CE/EMC Standards for Immunity and Emissions

The Model A25SB Absolute Encoder offers a high performance solution for your absolute feedback needs. This encoder is especially suited for applications where position information must be retained after loss of system power. It provides maintenance-free feedback thanks to its innovative battery-free and gear-free multi-turn technology. This encoder is the perfect choice for harsh industrial applications thanks to its rugged magnetic technology, available IP67 rating, and proven double bearing design. Available with several shaft sizes and mounting styles, the Model A25SB is easily designed into OEM and aftermarket applications.

COMMON APPLICATIONS

Robotics, Telescopes, Antennas, Medical Scanners, Wind Turbines, Elevators, Lifts, Motors, Automatic Guided Vehicles, Rotary and X/Y Positioning Tables

MODEL A25SB ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Mechanical | Electrical

A25SB	–	10	MA	–	12	10	CO	A	B	V4	–	RMJ	–		–	

MODEL
A25SB Absolute Series

SHAFT SIZE
10 10 mm
A9 3/8", 0.375"
A5 1/4", 0.250"

MOUNTING
MA 2.50" Flange
MC 2.50" Servo Mount

SINGLE TURN RESOLUTION
01 to 16 Bit

MULTI-TURN RESOLUTION
00 Single Turn
01 to 43 Multi-Turn

COMM PROTOCOL
CO CANopen[1]
SI SSI[2]

SOFTWARE REV
A Revison A

OUTPUT CODE
B Binary
G Gray[3]

INPUT VOLTAGE
5 5 VDC[3]
V4 10 to 32 VDC

CONNECTOR TYPE[4]
RMJ 5-pin M12 Side Mount[5]
RMK 8-pin M12 Side Mount[3]

TEMP
0° to 80° C Std
T5 -40° to 80° C

SEAL
IP50 Std
S3 IP66
S4 IP67

NOTES:

1 Please refer to *CANopen Interface Technical Reference Manual* at encoder.com.
2 Please refer to Technical Bulletin *TB-529: Understanding EPC's SSI Encoders* at encoder.com.
3 Available with SSI only.
4 For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
5 Available with CANopen only.

MODEL A25SB SPECIFICATIONS

Electrical

Input Voltage.....10 to 32 VDC max SSI or CANopen
5 VDC SSI Only
Input Current .....50 mA typical for 10 to 32 VDC
80mA typical for 5 VDC
Power Consumption ....0.5 W max
Resolution (Single) .....01 to 16 bit
Resolution (Multi).....01 to 43 bit
Accuracy.....± 0.35°
Repeatability .....± 0.2°
CE/EMC .....Immunity tested per EN 61000-6-2:2006
Emissions tested per EN 61000-6-3:2011

CANopen Interface

Protocol.....CANopen:
Communication profile CiA 301
Device profile for encoder CiA 406 V3.2 class C2
Node Number .....0 to 127 (default 127)
Baud Rate.....10 Kbaud to 1 Mbaud with automatic bit rate detection

Note: The standard settings, as well as any customization in the software, can be changed via LSS (CiA 305) and the SDO protocol (e.g., PDOs, scaling, heartbeat, node-ID, baud rate, etc.)

Programmable CANopen Transmission Modes

Synchronous.....When a synchronization telegram (SYNC) is received from another bus node, PDOs are transmitted independently
Asynchronous.....A PDO message is triggered by an internal event (e.g., change of measured value, internal timer, etc.)

SSI Interface

Clock Input .....Via opto coupler
Clock Frequency.....100KHz to 500KHz. Higher frequencies may be available. Contact Customer Service.
Data Output .....RS485 / RS422 compatible
Output Code .....Gray or binary
SSI Output .....Angular position value
Parity Bit.....Optional (even/odd)
Error Bit.....Optional
Turn On Time .....< 1.5 sec
Pos. Counting Dir.....Connect DIR to GND for CW
Connect DIR to VDC for CCW
(when viewed from shaft end)
Set to Zero.....Yes, see Technical Bulletin ***TB-529: Understanding EPC's SSI Encoders***
Protection .....Galvanic Isolation

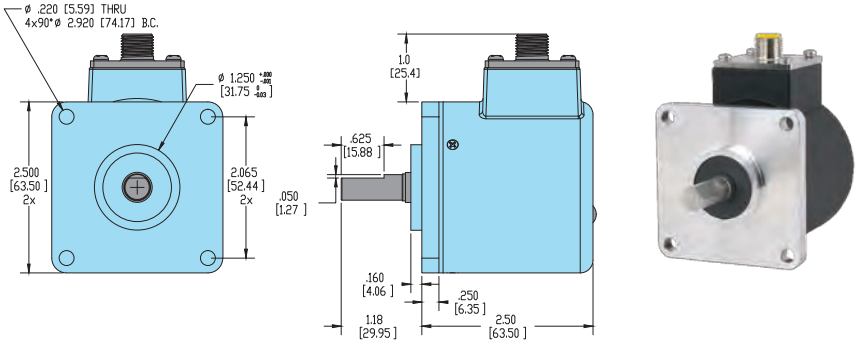
Mechanical

Max Shaft Speed.....8,000 RPM
Shaft Material .....303 Stainless Steel
Radial Shaft Load .....80 lb (355 N) max. Rated load of 20 to 40 lb (88 to 177 N) = bearing life of 1.5 x10^9 revolutions
Axial Shaft Load .....80 lb (355 N) max. Rated load of 20 to 40 lb (88 to 177 N) = bearing life of 1.5 x10^9 revolutions
Starting Torque .....1.0 oz-in typical with no seal
3.0 oz-in typical with IP66 shaft seal
7.0 oz-in typical with IP67 shaft seal
Housing .....Black non-corrosive finish
Weight.....20 oz typical

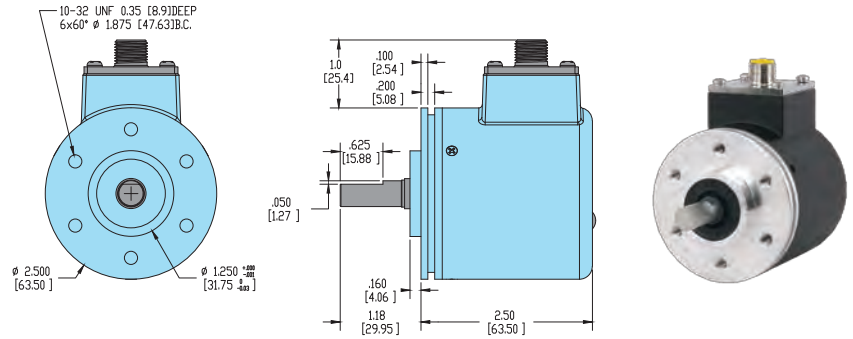
Environmental

Storage Temp .....-40° to 100° C
Humidity.....95% RH non-condensing
Vibration.....5 g @ 10 to 2000 Hz
Shock.....100 g @ 6 ms duration
Sealing.....IP50 standard; IP66 or IP67 optional

MODEL A25SB 2.5" FLANGE MOUNT (MA)



MODEL A25SB 2.5" SERVO MOUNT (MC)



All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.
Metric dimensions are given in brackets [mm].

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.
For CE (Conformity European) requirements, use M12 cordset with shield connected to M12 coupling nut.
Trim back and insulate unused wires.

SSI ENCODERS

Function	Pin
Ground (GND)	1
+VDC	2
SSI CLK+	3
SSI CLK-	4
SSI DATA+	5
SSI DATA-	6
PRESET	7
DIR	8
Shield	Housing

CANOPEN ENCODERS

Function	Pin
+VDC	2
Ground (GND)	3
CAN $_{High}$	4
CAN $_{Low}$	5
CAN $_{GND}$ / Shield	1

MODEL 925

Ø2.5"

FEATURES
Standard Size 25 Package (2.5")
Resolutions up to 12-Bit (4096 Counts)
Incorporates Opto-ASIC Technology
Industrial Grade, Heavy Duty Housing
Optional IP67 Seal

The Model 925 Single Turn Absolute Encoder is ideal for a wide variety of industrial applications that require an encoder with the capability of absolute positioning output. Its fully digital output and innovative use of Opto-ASIC technology make the Model 925 an excellent choice for all applications, especially ones with a high presence of noise. Available with either round servo or square flange mounting, and a variety of connector and cabling options, the Model 925 is easily designed into a variety of application requirements. The Model 925, with its wide selection of shaft sizes supported by industrial grade, heavy duty bearings, and optional IP67 seal, is ideal for rough environments.

COMMON APPLICATIONS
Machine Tools, Robotics, Telescopes, Antennas, Rotary & X-Y Positioning Tables, Medical Scanners

Not recommended for new applications.

MODEL 925 ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

925 – B – F – XXXX – CW – S – G/6 – 07 – N – PP – N

MODEL
925 Absolute Series
Size 25 (2.5")

OUTPUT CODE
G Gray
B Natural Binary
X Excess Gray

MOUNTING
F Flange
S 2.5" Servo

RESOLUTION
See Table Below

COUNT DIRECTION/ CODE INVERSION
CW Clockwise
CCW Counter Clockwise
CWI Clockwise/Inverted
CCI Counter Clockwise/Inverted

CONNECTOR LOCATION
S Side
E End

CONNECTOR TYPE [1,2]
C10 10-pin MS[3]
C16 16-pin M23
C19 19-pin Bayonet
G Gland, 24" cable (standard)[4]

SHAFT SIZE
07 1/4", 0.250"
19 5/16", 0.3125"
20 3/8", 0.375"
06 6 mm
18 8 mm
21 10 mm

SHAFT SEAL
N No Seal
1 IP66
2 IP64
5 IP67

OUTPUT TYPE
PP Push-Pull (standard)
OC Open Collector

CERTIFICATION
N None
CE CE Marked[5]

MODEL 925 RESOLUTION TABLE

Output Code	Counts Per Resolution						
Gray Code	0256	0512	1024	2048	4096		
Natural Binary	0250	0256	0360	0500	0512	0720	1000
	1024	1440	2000	2048	2880	4000	4096
Excess Gray	0180	0250	0360	0500	0720	1000	1440
	2000	2880	4000				

NOTES:
1 For additional connector styles, please contact Customer Service.
2 For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
3 Only available with 8-bit resolution encoder. Not available with CE.
4 For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: G/6 = 6 feet of cable.
5 Please refer to Technical Bulletin *TB100: When to Choose the CE Mark* at encoder.com. Contact Customer Service for availability.

MODEL 925 SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 26 VDC max
Regulation..... 100 mV peak-to-peak, max ripple at 0 to 10 kHz
Input Current ..... 100 mA max with no external load
Output Format..... Absolute – Parallel Outputs
Output Type ..... Open Collector – 20 mA max per channel
Push-Pull – 20 mA max per channel
Code ..... Gray Code, Natural Binary Code, Excess Gray Code
Max Frequency ..... 50 kHz (LSB)
Rise Time..... Less than 1 microsecond
Resolution ..... Up to 12 bit
Accuracy..... ±1/2 LSB

Control

Directional Control... Field selectable for increasing counts (CW or CCW)

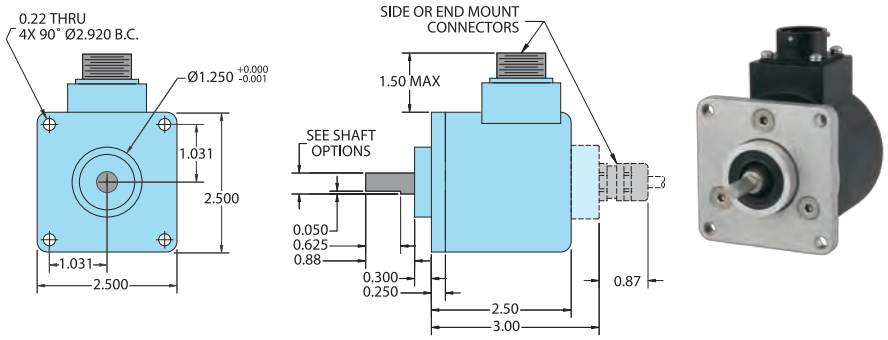
Mechanical

Max Shaft Speed..... 6000 RPM continuous
Radial Shaft Load ..... 35 lb max
Axial Shaft Load ..... 40 lb max
Starting Torque ..... 1.0 oz-in typical for no seal
2.0 oz-in typical with IP64 seal
3.0 oz-in typical with IP66 shaft seal
7.0 oz-in typcial with IP67 shaft seal
Housing ..... Aluminum
Weight..... 22 oz typical

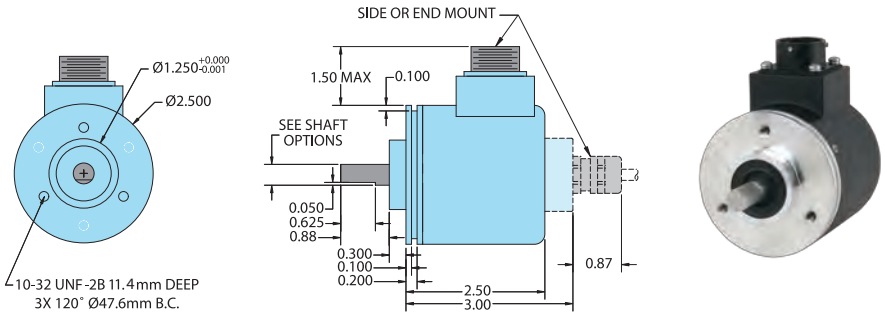
Environmental

Storage Temp ..... -20° to 85° C
Humidity..... 98% RH non-condensing
Vibration..... 10 g @ 58 to 500 Hz
Shock..... 20 g @ 11 ms duration
Sealing..... IP50 standard; IP64, IP66 or IP67 optional

MODEL 925 2.5" FLANGE MOUNT (F)



MODEL 925 2.5" SERVO MOUNT (S)



All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.
Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	19-pin Bayonet KPT02E14-19P	16-pin M23	10-pin MS*
S1 MSB	Brown	A	3	A
S2	White	B	5	B
S3	Green	C	6	C
S4	Orange	D	7	D
S5	Blue	E	8	E
S6	Violet	F	9	F
S7	Gray	G	10	G
S8 LSB 8-bit	Pink	H	11	H
S9 LSB 9-bit	Red/Green	J	12	--
S10 LSB 10-bit	Red/Yellow	K	13	--
S11 LSB 11-bit	Turquoise	L	14	--
S12 LSB 12-bit	Yellow	M	15	--
Direction+	Red/Blue	R	4	--
Case Ground	Drain/Screen	S	16	--
0V Common	Black	T	1	J
Special**	White/Red	U	--	--
+VDC	Red	V	2	I

*Only available with 8-bit resolution encoder. Not available with CE.
**Where fitted.
+Direction control Standard is CW increasing when viewed from the shaft end. Direction pin is pulled high to 5V internally. Direction pin must be pulled low (GND, Common) to reverse count direction. Applied voltage to direction pin should not exceed 5V.
†Standard cable is 24 AWG conductors with foil and braid shield.

MODEL 960

Ø2.0"

FEATURES
Low-Profile – 1.55"
Thru-Bore or Hollow Bore Styles
Industrial Grade, Heavy Duty Housing
State-of-the-Art Opto-ASIC Circuitry

The single turn Model 960 Absolute Series Encoder provides a unique solution to a wide variety of industrial applications requiring absolute position information. By providing a low profile package of just 1.55", as well as a variety of hollow and thru-bore sizes and an easy to use flexible mounting system, the Model 960 goes where traditional absolute encoders do not fit. In addition, its innovative Opto-ASIC circuitry, coupled with its digital output, make it an excellent choice in those applications plagued by an unusually high level of electrical noise. The Model 960 can easily be mounted directly on a motor shaft, bringing the advantage of absolute positioning in an all metal housing, while eliminating the fixtures, couplers and adapters required by other absolute encoder designs.

COMMON APPLICATIONS
Machine Tools, Robotics, Telescopes, Antennas, Rotary & X-Y Positioning Tables, Medical Scanners

Not recommended for new applications.

MODEL 960 ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

960 – T – 01 – G – 09 – PP – SF – G/6 – CE

MODEL
960 Absolute Series Thru-Bore

HOUSING STYLE
T Thru-Bore
B Hollow Bore

BORE SIZE
01 1/4", 0.250"
02 3/8", 0.375"
04 6 mm
14 8 mm
05 10 mm

OUTPUT CODE
G Gray Code

RESOLUTION
(Bits, Counts Per Revolution)
08 8 bit, 0256
09 9 bit, 0512
10 10 bit, 1024
11 11 bit, 2048
36 9 bit, 360 (XS76)
72 10 bit, 720 (XS152)

OUTPUT TYPE
PP Push Pull (Standard)
OC Open Collector

MOUNTING
SF Standard Slotted Flex Mount
FA Flexible Arm

CONNECTOR TYPE
G Gland, 18" Cable[1]

CERTIFICATION
N None
CE CE Marked[2]

NOTES:
1 For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: G/6 = 6 feet of cable.
2 Please refer to Technical Bulletin *TB100: When to Choose the CE Mark* at encoder.com.

MODEL 960 SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 26 VDC max
Regulation..... 100 mV peak-to-peak, max ripple at 0 to 10 kHz
Input Current..... 100 mA max with no external load
Output Format..... Absolute – Parallel Outputs
Output Type..... Open Collector – 20 mA max per channel
Push-Pull – 20 mA max per channel
Code..... Gray Code, Excess Gray Code
Max Frequency..... 25.6 kHz (LSB)
Rise Time..... Less than 1 microsecond
Resolution..... Up to 11 bit
Accuracy..... ±1/2 LSB

Control

Directional Control... Field selectable for increasing counts (CW or CCW). Standard configuration user selects the applicable MSB wire for direction of count. Direction control option allows user to select count direction by applying 0 VDC to an encoder input. See *Wiring Table*.

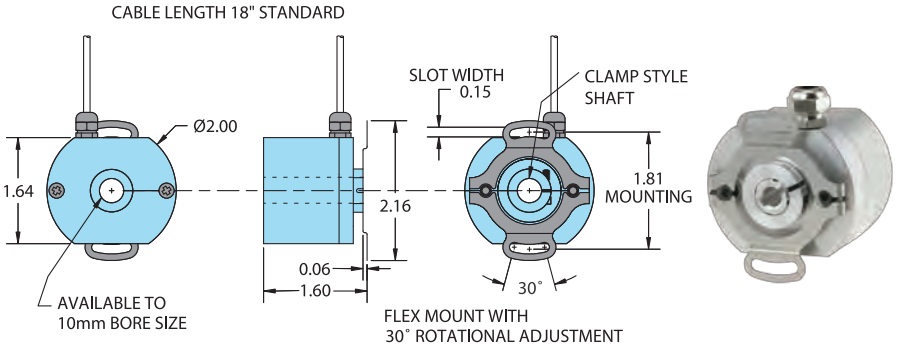
Mechanical

Max Shaft Speed..... 6000 RPM continuous
Bore Size..... 0.250", 0.3125", 0.375", 6 mm, 8 mm, 10 mm
Bore Tolerance..... -0.0000" / +0.0006"
User Shaft Tolerances
Radial Runout..... 0.007"
Axial Endplay..... ±0.030"
Starting Torque..... 0.3 oz-in typical for thru-bore
0.14 oz-in typical for hollow bore
Electrical Conn..... Gland with 18" cable (braid shield, 30 AWG conductors)
Housing..... Aluminum with non-corrosive finish
Mounting..... Slotted Flex Mount standard, Flex Arm optional
Weight..... 7 oz typical

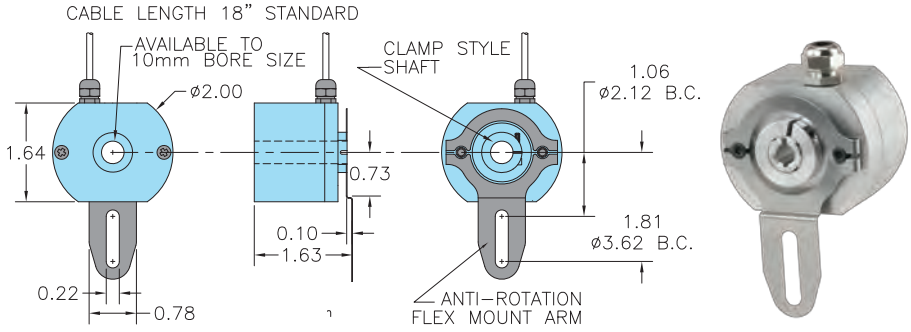
Environmental

Operating Temp..... 0° to 70° C
Storage Temp..... -20° to 85° C
Humidity..... 98% RH non-condensing
Vibration..... 10 g @ 58 to 500 Hz
Shock..... 20 g @ 11 ms duration
Sealing..... IP50

MODEL 960 SLOTTED FLEX MOUNT (SF)



MODEL 960 WITH FLEX ARM (FA)



All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.
Trim back and insulate unused wires.

Function	Gland Cable† Wire Color
Common	Black
+VDC	Red
S1 CW MSB	Brown
S1 CCW MSB	Yellow
S2	White
S3	Green
S4	Orange
S5	Blue
S6	Violet
S7	Gray
S8 LBS 8-bit	Pink
S9 LSB 9-bit	Red/Green
S10 LSB 10-bit	Red/Yellow
S11 LSB 11-bit	Turquoise
Direction Control**	Red/blue
Case Ground*	Shield

*CE Option only.
**Standard is CW increasing count (when viewed from shaft end, and using brown wire for MSB). Red/Blue is pulled up internally to 5 VDC. To reverse count direction, Red/Blue must be pulled to low (0 VDC). If 5 VDC is applied to Red/Blue, unit remains in standard CW increasing count mode. Count direction can also be reversed by using the yellow MSB wire instead of the Brown. At no time should voltage applied to Red/Blue exceed 5 VDC.
†Standard cable is 24 AWG conductors with foil and braid shield.

TRU–FLEXIBILITY

The Tru-Trac™ Family of Linear Solution Encoders

Companies spend hours designing measuring wheel and bracket assemblies, to attach to an encoder, to measure position or velocity. That design time costs money. What's more, adjusting the pressure of the measuring wheel once it's been installed is often a major challenge – costing yet more time and money. Thanks to EPC's Tru-Trac™ Linear Measurement Solution Encoders, you now have a ready-made solution.

Easy to use and very compact, the Tru-Trac™ encoders are fully adjustable, integrated encoders with spring-loaded measuring wheel assemblies. Monitoring speed, velocity, or position has never been easier or more cost effective. Designed for use in almost any position and orientation, installation possibilities are endless. The threaded shaft on the pivot axis makes these units reversible, allowing measuring from either side of the assembly.

A variety of available measuring wheels, together with the flexibility of the adjustable spring loaded torsion arm, prevents slippage over many different surfaces or textures (for more on measuring wheel options, see page 35). Have an application with a unique surface or measurements? No problem. Order your Tru-Trac™ without a wheel, and you can install your own measuring wheel. Simple torsion control provides easy wheel pressure adjustment in seconds, allowing various thicknesses of materials to be measured.

Common applications include: Web Tension Control, Paper Monitoring, Glue Dispensing, Linear Material Monitoring, Conveyor Systems, Printing, Labeling, and Document Handling.

The Tru-Trac™ encoders are perfect for linear applications and can be mounted above or below the moving object. The spring-loaded torsion arm allows the tension on the wheel to be adjusted, so that measurement can be obtained over a variety of different surfaces and textures. Perfect for cut-to-length, packaging, conveyors, mail sorting and gantry applications.

The Tru-Trac™ encoders can be mounted in any orientation to monitor velocity. This is perfect for many rotational applications such as web tension control drums, rotary tables, printing, spooling, etc.

The Tru-Trac™ by Encoder Products Company is a versatile solution for tracking velocity, position, or distance over a wide variety of surfaces in almost any application.

Model TR1

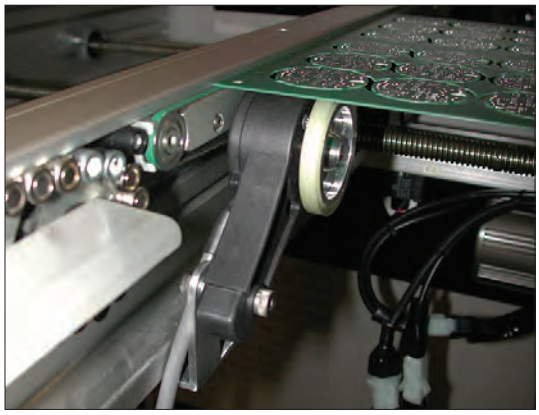
Model TR2

Model TR3
Available with single or dual wheels

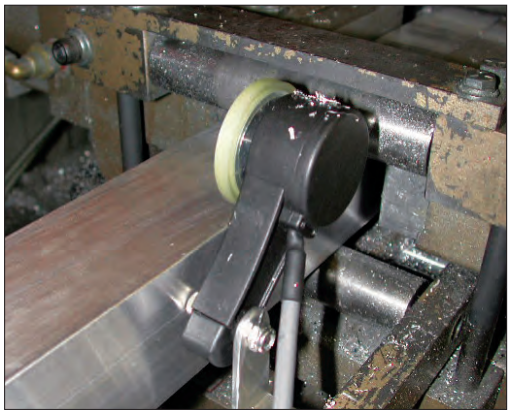
For specification assistance call Customer Service at **1-800-366-5412.**

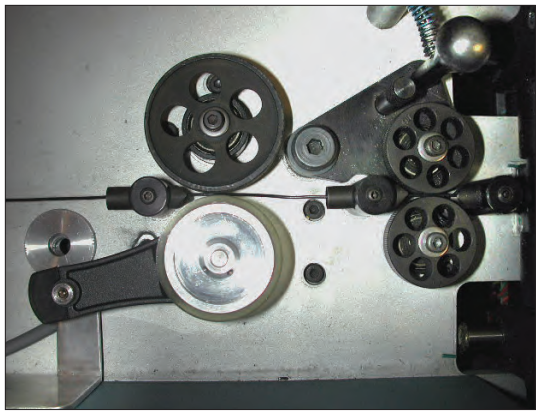
TRU–TRAC™ ENCODERS ON THE JOB

Model TR1 Tru-Trac™ Applications

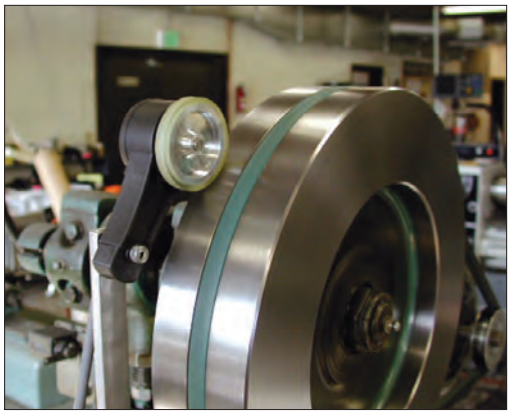


For linear applications, the Tru-Trac™ can be mounted above or below the moving object, and the tension on the wheel can be adjusted for a wide range of applications, such as packaging, conveyors, mail sorting, cut-to-length, labeling, gantries, etc.



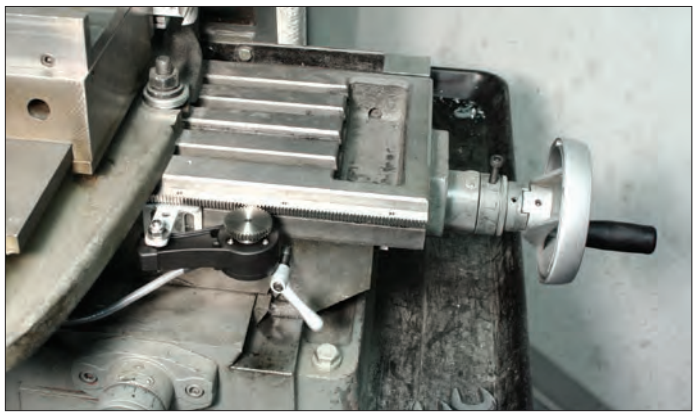


For rotational applications, the Tru-Trac™ can be mounted in any orientation to monitor the position or velocity of many types of rotating equipment, such as web tension control drums, rotary tables, printing, spooling, etc.



Model TR2 Tru-Trac™ Applications

For reciprocating linear motion applications, the TR2 provides accurate reliable feedback. The adjustable spring inside the torsion arm allows the TR2 to be oriented in any direction, while still ensuring the pinion gear is properly engaged with the rack. The precision pinion gear, when paired with EPC's stainless steel or flexible rack system provides feedback with virtually no backlash.



The TR2 is ideal for gauging and backstop applications typically found on a variety of metal working equipment.

The Model TR2 is applied to provide vertical speed and position feedback for a fork lift tower.

MODEL TR1 TRU-TRAC™

FEATURES

Encoder and Measuring Wheel Solution Integrated Into One Compact Unit
Spring Loaded Torsion Arm Makes Wheel Pressure Adjustments a Snap
Easily Installed in a Vertical, Horizontal or Upside Down Orientation
Operates Over a Variety of Surfaces at Speeds up to 3000 Feet per Minute
Integrated Module Simplifies Your System Design, Reducing Cost

With operating speeds up to 3000 feet per minute and a wide variety of configuration options, the TR1 Tru-Trac™ is the versatile solution for tracking velocity, position, or distance over a wide variety of surfaces in almost any application. An integrated encoder and spring-loaded measuring wheel assembly available in one unit, the TR1 is both easy-to-use and compact. Plus, the TR1 housing is a durable, conductive composite material that will eliminate static build up. Its spring-loaded torsion arm offers adjustable torsion load, allowing the TR1 to be mounted in almost any orientation – even upside-down. And the threaded shaft on the pivot axis is easily reversible in the field, providing mounting access from either side. The TR1 is your solution for a compact, linear encoder.

COMMON APPLICATIONS

Web Tension Control, Paper Monitoring, Glue Dispensing, Linear Material Monitoring, Conveyor Systems, Printing, Labeling, Document Handling

MODEL TR1 TRU-TRAC™ ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Mechanical | Electrical | Optional Features (Leave Blank For Standard Options)

TR1	–	U1	R4	–	0500	N	V1	A	OC	–	F00	–				
													-20° to 85°C Std	IP50 Std	None Std	

MODEL
TR1 Tru-Trac™

CYCLES PER REVOLUTION
See *CPR Options* below
Price adder > 1999

PIVOT SHAFT MOUNTING[1]
R4 Right side 1/4-20 thread
L4 Left side 1/4-20 thread
R6 Right side M6 thread
L6 Left side M6 thread

WHEEL TYPE & CIRCUMFERENCE
U1 Urethane 6" cir
U2 Urethane 200 mm cir
K1 Knurled 6" cir
K2 Knurled 200 mm cir
A1 Anodized Knurled 6.0" cir
A2 Anodized Knurled 200 mm cir
19 No Wheel - 1/4" shaft
20 No Wheel - 6 mm shaft

INPUT VOLTAGE
V1 5 to 28 VDC

NUMBER OF CHANNELS[2]
A Channel A
Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index
Channel B Leads A[3]
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index

OUTPUT TYPE
OC Open Collector
PP Push-Pull
HV Line Driver4
PU Pull-Up Resistor[3,5]
OD Open Collector with Differential Outputs

CONNECTOR TYPE[6]
F00 18" Cable[7] (Std)
F01 12" Cable
F02 24" Cable
F03 36" Cable
M00 2M Cable[7]
J00 18" Cable with 5-pin M12[4]
K00 18" Cable with 8-pin M12

MAXIMUM FREQUENCY
Standard
F3 Extended
See Specifications

OPERATING TEMPERATURE
-20° to 85° C (Std)
T1 -40° to 85° C
T2 -20° to 100° C

SEALING
IP50 (Std)
S2 IP65
S3 IP66

CERTIFICATION
None (Std)
CE CE Marked[9]

MODEL TR1 TRU-TRAC™ CPR OPTIONS

0001 thru 0189*	0198	0200	0250	0256	0300	0315	0360	
0400	0500	0512	0580	0600	0750	0800	1000	1024
1200	1250	1500	1800	2000	2048	2500	2540	3000
3600	4000	4096	5000	6000	7200	8192	10,000	

*Contact Customer Service for Availability

New CPR values are periodically added to those listed. Contact Customer Service to determine all currently available values. Special disk resolutions are available upon request and may be subject to a one-time NRE fee.

NOTES:

1. See mechanical drawing. Shaft is reversible in the field.
2. Contact Customer Service for non-standard index gating or phase relationship options.
3. Reverse Quadrature not available with Pull-Up Resistor Output Type.
4. Line Driver output not available with 5-pin M12 connector. Additional cable lengths available. Please consult Customer Service.
5. With Input Voltage above 16 VDC, operating temperature is limited to 85° C.
6. For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
7. For non-standard English cable lengths enter 'F' plus cable length expressed in feet. Example: F06 = 6 feet of cable. Frequency above 300 kHz standard cable lengths only.
8. For non-standard metric cable lengths enter 'M' plus cable length expressed in meters. Example: M06 = 6 meters of cable.
9. Please refer to Technical Bulletin *TB100: When to Choose the CE Mark* at encoder.com.

MODEL TR1 TRU-TRAC™ SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 85° C
4.75 to 24 VDC for temperatures between 85° C and 100° C

Input Current ..... 100 mA max (65 mA typical) with no output load

Output Format..... Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the shaft side. See *Waveform Diagram*.

Output Types..... Open Collector – 20 mA max per channel
Push-Pull – 20 mA max per channel
Pull-Up – Open Collector with 2.2K ohm internal resistor, 20 mA max per channel
Line Driver – 20 mA max per channel (Meets RS 422 at 5 VDC supply)

Index..... Once per revolution.
0001 to 0189 CPR: Ungated
0190 to 10,000 CPR: Gated to output A
See *Waveform Diagram*.

Max. Frequency ..... Standard Frequency Response is
200 kHz for CPR 1 to 2540
500 kHz for CPR 2541 to 5000
1 MHz for CPR 5001 to 10,000
Extended Frequency Response (optional) is 300 kHz for CPR 2000, 2048, 2500, and 2540

Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.

Noise Immunity..... Tested to BS EN61000-6-2; BS EN50081-2; BS EN61000-4-2; BS EN61000-4-3; BS EN61000-4-6; BS EN500811

Quadrature..... 67.5° electrical or better is typical,
Edge Separation 54° electrical minimum at temperatures > 99° C

Waveform Symmetry ... 180°(±18°) electrical (single channel encoder)

Accuracy..... Within 0.017° mechanical or 1 arc-minute from true position (for CPR > 189)

Mechanical

Max Shaft Speed..... 6000 RPM. Higher speeds may be achievable;- contact Customer Service.

Shaft Material ..... Stainless Steel

Shaft Tolerance ..... +0.0000/-0.0004" [+0.000/-0.010 mm]

Radial Shaft Load ..... 5 lb max. Rated load of 2 to 3 lb for bearing life of 1.2 x 10^{10} revolutions

Axial Shaft Load ..... 5 lb max. Rated load of 2 to 3 lb for bearing life of 1.2 x 10^{10} revolutions

Starting Torque ..... IP50 0.05 oz-in
IP65 0.4 oz-in
IP66 0.8 oz-in

Housing ..... Stainless steel fibers in a high temperature nylon composite

Wheel Width..... 0.25"

Weight..... 5 oz typical

Environmental

Storage Temp ..... -25° to 85° C

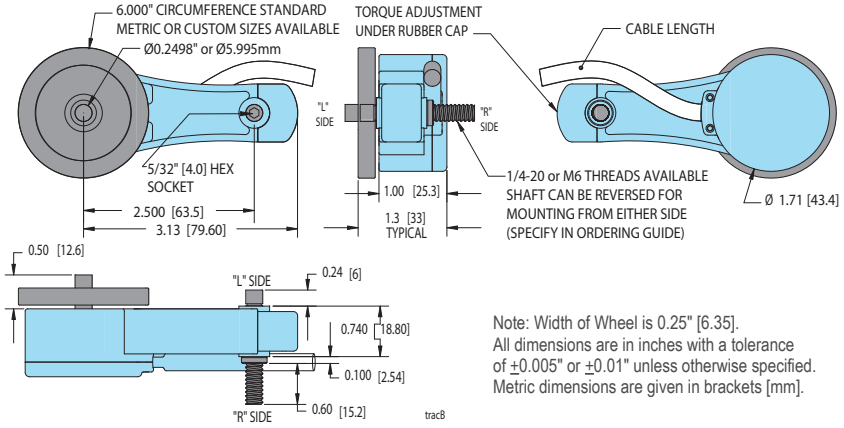
Humidity..... 98% RH non-condensing

Vibration..... 10 g @ 58 to 500 Hz

Shock..... 80 g @ 11 ms duration

Sealing..... IP50 standard; IP65 or IP66 available

MODEL TR1 TRU-TRAC™



Note: Width of Wheel is 0.25" [6.35].
All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.
Metric dimensions are given in brackets [mm].

WIRING TABLE

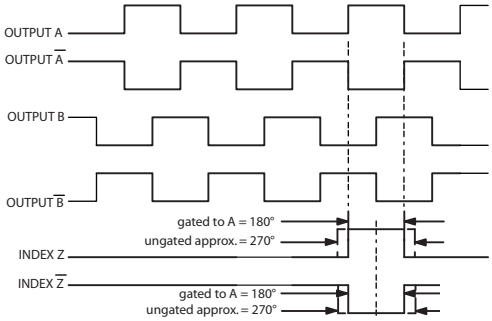
For EPC-supplied mating cables, refer to wiring table provided with cable.
Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	5-pin M12**	8-pin M12**
Com	Black	3	7
+VDC	White	1	2
A	Brown	4	1
A'	Yellow	--	3
B	Red	2	4
B'	Green	--	5
Z	Orange	5	6
Z'	Blue	--	8
Shield	Bare*	--	--

*CE Option: Cable shield (bare wire) is connected to internal case.
†Standard cable is 24 AWG conductors with foil and braid shield.
**CE Option: Use cable cordset with shield connected to M12 connector coupling nut.

WAVEFORM DIAGRAM

Incremental Signals



CLOCKWISE ROTATION AS VIEWED FROM THE SHAFT SIDE.

NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES.
WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS $\overline{A}$, $\overline{B}$, $\overline{Z}$ FOR HV OUTPUT ONLY.

MODEL TR2 TRU-TRAC™ WITH RACK AND PINION GEARING

FEATURES

Encoder with Rack-and-Pinion Gear Integrated into One Compact Unit
Easily Installed in a Vertical, Horizontal or Upside Down Orientation
Operates at Speeds up to 400 Feet per Minute
Spring Loaded Torsion Arm Eliminates Gear Backlash
Integrated Module Simplifies Your System Design

The TR2 Tru-Trac™ is a versatile solution for tracking velocity, position, or distance in almost any application and features an integrated encoder with a rack-and-pinion gear assembly. Using the rack-and-pinion gear system, encoder readings can be obtained with repeatable positioning, providing excellent accuracy. Racks can be ordered in varying lengths, and with the accessory spacer block, multiple lengths of rack can be joined for easy installation. The spring loaded torsion arm provides easily adjustable torsion load, giving the TR2 all the flexibility and maneuverability of the original TR1 Tru-Trac™. It can be installed in a horizontal, vertical, or upside down position. The threaded shaft on the TR2's pivot axis is field reversible, providing mounting access from either side. And the durable conductive composite housing material reduces static build up.

COMMON APPLICATIONS

X-Y Tables, Gantry Systems, Packaging Machinery, Cut-to-Length, Printing, Labeling, Document Handling, Machine Shop Equipment

MODEL TR2 TRU-TRAC™ ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Mechanical | Electrical | Optional Features (Leave Blank for Standard Options)

TR2	–	D1	R4	–	0800	N	V1	A	OC	–	F00	–				
														-20° to 85°C Std	IP50 Std	None Std

MODEL
TR2 Tru-Trac™

CYCLES PER REVOLUTION
See Resolution Chart Below
Price adder >1999

INPUT VOLTAGE
V1 5 to 28 VDC

OUTPUT TYPE
OC Open Collector
PP Push-Pull
HV Line Driver[4]
PU Pull-Up Resistor[3,5]
OD Open Collector with Differential Outputs

OPERATING TEMPERATURE
-20° to 85° C (Std)
T1 -40° to 85° C
T2 -20° to 100° C

CERTIFICATION
None (Std)
CE CE Marked[9]

PIVOT SHAFT MOUNTING[1]
R4 Right side 1/4-20 thread
L4 Left side 1/4-20 thread
R6 Right side M6 thread
L6 Left side M6 thread

MAXIMUM FREQUENCY
Standard
F3 Extended
See Specifications

SEALING
IP50 (Std)
S2 IP65
S3 IP66

PINION GEAR
D1 40 Tooth Pinion Gear for Stainless Steel Rack
D2 40 Tooth Pinion Gear for Flexible Rack
19 No Pinion, 1/4" Shaft
20 No Pinion, 6 mm Shaft

NUMBER OF CHANNELS[2]
A Channel A
Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index
Channel B Leads A[3]
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index

CONNECTOR TYPE[6]
F00 18" Cable[7] (Std)
F01 12" Cable
F02 24" Cable
F03 36" Cable
M00 2M Cable[8]
J00 18" Cable with 5-pin M12[4]
K00 18" Cable with 8-pin M12

MODEL TR2 TRU-TRAC™ CPR OPTIONS

0001 thru 0189*	0198	0200	0250	0256	0300	0315	0360	
0400	0500	0512	0580	0600	0750	0800	1000	1024
1200	1250	1500	1800	2000	2048	2500	2540	3000
3600	4000	4096	5000	6000	7200	8192	10,000	

New CPR values are periodically added to those listed. Contact Customer Service to determine all currently available values. Special disk resolutions are available upon request and may be subject to a one time NRE fee.

NOTES:

1. See mechanical drawing. Shaft is reversible in the field.
2. Contact Customer Service for non-standard index gating or phase relationship options.
3. Reverse Quadrature not available with Pull-Up Resistor Output Type.
4. Line Driver output not available with 5-pin M12 connector. Additional cable lengths available. Please consult Customer Service.
5. With Input Voltage above 16 VDC, operating temperature is limited to 85° C.
6. For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com..
7. For non-standard English cable lengths enter 'F' plus cable length expressed in feet. Example: F06 = 6 feet of cable. Frequency above 300 kHz standard cable lengths only.
8. For non-standard metric cable lengths enter 'M' plus cable length expressed in meters. Example: M06 = 6 meters of cable.
9. Please refer to Technical Bulletin *TB100: When to Choose the CE Mark* at encoder.com.

MODEL TR2 TRU-TRAC™ SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 85° C 4.75 to 24 VDC for temperatures between 85° C to 100° C

Input Current ..... 100 mA max (65 mA typical) with no output load

Output Format..... Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the wheel side. See *Waveform Diagram*.

Output Types..... Open Collector- 20 mA max per channel
Push-Pull – 20 mA max per channel
Pull-Up – Open Collector with 2.2K ohm internal resistor, 20 mA max per channel
Line Driver – 20 mA max per channel
(Meets RS 422 at 5 VDC supply)

Index..... Once per revolution.
0190 to 10,000 CPR: Gated to output A.
0001 to 0189 CPR: Ungated
See *Waveform Diagram*.

Max. Frequency ..... Standard Frequency Response is
200 kHz for CPR 1 to 2540
500 kHz for CPR 2541 to 5000
1 MHz for CPR 5001 to 10,000
Extended Frequency Response (optional) is
300 kHz for CPR 2000, 2048, 2500, & 2540

Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.

Noise Immunity..... Tested to BS EN61000-6-2; BS EN50081-2; BS EN61000-4-2; BS EN61000-4-3; BS EN61000-4-6, BS EN500811

Quadrature..... 67.5° electrical or better is typical,
Edge Separation 54° electrical minimum at temperatures > 99° C

Waveform Symmetry ... 180°(±18°) electrical (single channel encoder)

Accuracy..... Within 0.017° mechanical or 1 arc-minute from true position (for CPR>189)

Mechanical

Radial Shaft Load .... 5 lb max. Rated load of 2 to 3 lb for bearing life of 1.2 x 10^{10} revolutions

Axial Shaft Load ..... 5 lb max. Rated load of 2 to 3 lb for bearing life of 1.2 x 10^{10} revolutions

Starting Torque ..... IP50 0.05 oz-in
IP65 0.4 oz-in
IP66 0.8 oz-in

Housing ..... Stainless steel fibers in a high temperature nylon composite

Weight..... 5 oz typical

Environmental

Storage Temp ..... -25° to 85° C

Humidity..... 98% RH non-condensing

Vibration..... 10 g @ 58 to 500 Hz

Shock..... 80 g @ 11 ms duration

Sealing..... IP50 standard; IP65 or IP66 available

Mechanical - Stainless Steel Rack

Max Linear Speed .... 400 Feet Per Minute. Speeds over 200 FPM require lubricant, such as MoS_2 paste, to reduce gearing wear. Higher speeds may be achievable, contact Customer Service.

Rack Material ..... 303 Stainless Steel

Gearing Tolerance .... AGMA 10, 20 degree pressure angle teeth

Accuracy..... ±0.0005 inch/inch max accumulated error

Repeatability..... ±0.0001 inch

Mechanical - Flexible Rack

Max Linear Speed .... 200 Feet Per Minute

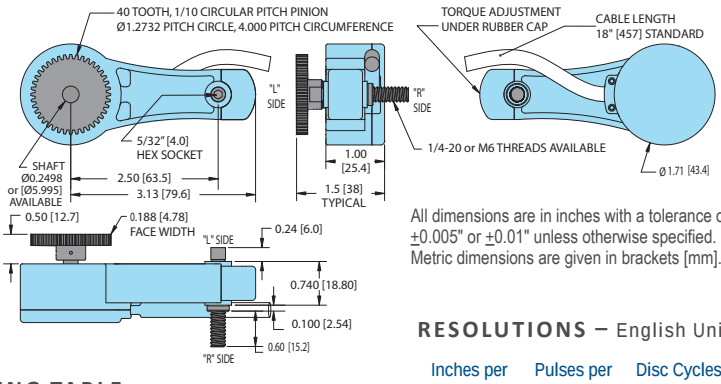
Rack Material ..... Acetal

Gearing Geometry ... 20° pressure angle teeth

Accuracy..... ±0.002 inch/inch max accumulated error

Repeatability..... ±0.001 inch for Flexible Rack

MODEL TR2 TRU-TRAC™



All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified. Metric dimensions are given in brackets [mm].

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.
Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	5-pin M12**	8-pin M12**
Com	Black	3	7
+VDC	White	1	2
A	Brown	4	1
A'	Yellow	--	3
B	Red	2	4
B'	Green	--	5
Z	Orange	5	6
Z'	Blue	--	8
Shield	Bare*	--	--

*CE Option: Cable shield (bare wire) is connected to internal case.
†Standard cable is 24 AWG conductors with foil and braid shield.
**CE Option: Use cable cordset with shield connected to M12 connector coupling nut.

RESOLUTIONS – English Units

Inches per Pulse	Pulses per Inch	Disc Cycles per Revolution
0.01	100	400
0.005	200	800
0.004	250	1000
0.002	500	2000
0.001	1000	2000*
0.0005	2000	2000**
0.0004	2500	2500**
0.0002	5000	2500**+
0.0001	10,000	2500**++

*Requires 2x external quadrature counting.
**Requires 4x external quadrature counting.
+Requires 2x Interpolation.
++Requires 4x Interpolation.

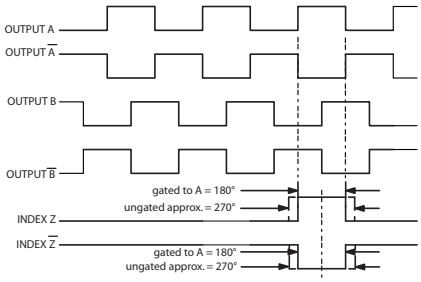
RESOLUTIONS – Metric Units

mm per Pulse	Pulses per mm	Disc Cycles per Revolution
0.04	25	2540
0.02	50	2540*
0.01	100	2540**

*Requires 2x external quadrature counting.
**Requires 4x external quadrature counting.

WAVEFORM DIAGRAM

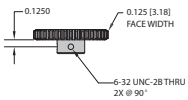
Incremental Signals



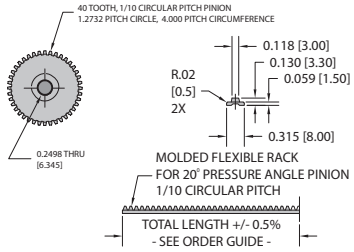
CLOCKWISE ROTATION AS VIEWED FROM THE SHAFT SIDE

NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV OUTPUT ONLY.

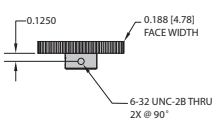
PINION GEAR FOR FLEXIBLE RACK

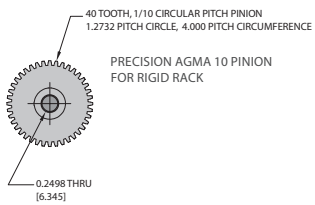


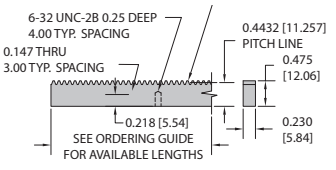
0.125 FACE WIDTH PINION FOR FLEXIBLE RACK

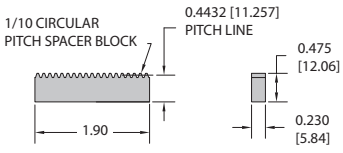


PINION GEAR FOR STAINLESS STEEL RACK









MODEL TR3 HEAVY DUTY TRU-TRAC™

FEATURES

Integrated Heavy Duty Encoder and Measuring Wheel In One
Spring Loaded Torsion Arm for Quick Wheel Pressure Adjustments
Easily Installed in a Vertical, Horizontal or Upside-Down Orientation
Operates Over a Variety of Surfaces at Speeds up to 3000 Feet per Minute
Integrated Module Simplifies System Design, Reducing Cost

The TR3 Heavy Duty Tru-Trac™ is an integrated, heavy duty encoder and spring loaded measuring wheel assembly all in one unit. Available in both single or optional dual-wheel format, the TR3 Heavy Duty Tru-Trac™ is a versatile solution for tracking velocity, position or distance over a wide variety of surfaces in many industrial applications. Its spring loaded torsion arm provides a simple-to-adjust torsion load, allowing the TR3 Heavy Duty Tru-Trac™ to be mounted in any orientation, even upside-down. The TR3 Heavy Duty Tru-Trac™ housing is an all metal work horse, specifically designed to take on your toughest application environments at operating speeds up to 3000 feet per minute. Just one look and it's easy to see the TR3 Heavy Duty Tru-Trac™ is the ideal solution for countless applications.

COMMON APPLICATIONS

Lumber, Corrugated, Converting, Metal Roll Forming, Paper Monitoring, Glue Dispensing, Linear Material Monitoring, Conveyor Systems, Printing, Labeling, Mining, Construction

MODEL TR3 HEAVY DUTY TRU-TRAC™ ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Mechanical | Electrical | Optional Features (Leave Blank for Standard Options)

TR3 – U3 A – 0500 N V1 A OC – F00 – [ ] [ ] [ ] [ ] [ ]

[ ] = -20° to 85° C Std | IP50 Std | None Std

MODEL
TR3 Tru-Trac™

WHEEL TYPE & CIRCUMFERENCE
U3 Urethane 12" cir
U5 Urethane 300 mm cir
K3 Knurled 12" cir
K5 Knurled 300 mm cir
25 No Wheel 3/8" (0.375") Shaft
A3 Hard Anodized Knurled 12" cir
A5 Hard Anodized Knurled 1/3 M cir

WHEEL CONFIGURATION
A Single
B Double

CYCLES PER REVOLUTION
See *CPR Options* below
Price adder >1999

INPUT VOLTAGE
V1 5 to 28 VDC

NUMBER OF CHANNELS[1]
A Channel A

Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index

Channel B Leads A[2]
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index

OUTPUT TYPE
OC Open Collector
PP Push-Pull
HV Line Driver[3]
PU Pull-Up Resistor[2,4]
OD Open Collector with Differential Outputs

CONNECTOR TYPE[5]
F00 18" Cable[6] (Std)
F01 12" Cable
F02 24" Cable
F03 36" Cable
M002M Cable[7]
SMW 6-pin MS[8]
SMY 7-pin MS[8]
SMX 10-pin MS[8]
SMJ 5-pin M12[3,8]
SMK 8-pin M12[8]

CONNECTOR ORIENTATION
(See Drawing)
Standard Rear Exit
L1 60° From Standard
L2 120° From Standard
L3 180° From Standard
L4 240° From Standard
L5 300° From Standard

MAXIMUM FREQUENCY
Standard
F3 Extended
See Specifications

OPERATING TEMPERATURE
-20° to 85° C (Std)
T1 -40° to 85° C[9]
T2 -20° to 100° C

SEALING
IP50 (Std)
S3 IP66
S4 IP67

CERTIFICATION
None (Std)
CE CE Marked[10]

MODEL TR3 TRU-TRAC™ CPR OPTIONS

0001 thru 0189*	0198	0200	0250	0256	0300	0315	0360	
0400	0500	0512	0580	0600	0750	0800	1000	1024
1200	1250	1500	1800	2000	2048	2500	2540	3000
3600	4000	4096	5000	6000	7200	8192	10,000	

*Contact Customer Service For Availability

New CPR values are periodically added to those listed. Contact Customer Service to determine all currently available values. Special disk resolutions are available upon request and may be subject to a one-time NRE fee.

NOTES:
1 Contact Customer Service for non-standard index gating or phase relationship options.
2 Reverse Quadrature not available with Pull-Up Resistor Output Type.
3 Line Driver not available with 5-pin M12 connector.
4 With Input Voltage above 16 VDC, operating temperature is limited to 85° C.
5 For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
6 For non-standard English cable lengths enter 'F' plus cable length expressed in feet. Example: F06 = 6 feet of cable. Frequency above 300 kHz standard cable lengths only.
7 For non-standard metric cable lengths enter 'M' plus cable length expressed in meters. Example: M06 = 6 meters of cable.
8 Body Mount connector options only available with connector orientation L1 thru L5.
9 Rated to -40° C during encoder operation. Storage and startup below -25° C not recommended.
10 Please refer to Technical Bulletin *TB100: When to Choose the CE Mark* at encoder.com.

MODEL TR3 TRU-TRAC™ SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 85° C
4.75 to 24 VDC for temperatures between 85° C to 100° C

Input Current ..... 100 mA max (65 mA typical) with no output load

Output Format ..... Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the shaft side. (For units with dual wheels, orient the encoder so that the label is readable). See *Waveform Diagram*.

Output Types..... Open Collector – 20 mA max per channel
Push-Pull – 20 mA max per channel
Pull-Up – Open Collector with 2.2K ohm internal resistor, 20 mA max per channel
Line Driver – 20 mA max per channel
(Meets RS 422 at 5 VDC supply)

Index..... Once per revolution.
0190 to 10,000 CPR: Gated to output A
0001 to 0189 CPR: Ungated
See *Waveform Diagram*.

Max. Frequency ..... Standard Frequency Response is
200 kHz for CPR 1 to 2540
500 kHz for CPR 2541 to 5000
1 MHz for CPR 5001 to 10,000
Extended Frequency Response (optional) is
300 kHz for CPR 2000, 2048, 2500, and 2540

Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.

Noise Immunity..... Tested to BS EN61000-6-2; BS EN50081-2; BS EN61000-4-2; BS EN61000-4-3; BS EN61000-4-6, BS EN500811

Quadrature..... 67.5° electrical or better is typical,
Edge Separation 54° electrical minimum at temperatures > 99° C

Waveform Symmetry .. 180°(±18°) electrical (single channel encoder)

Accuracy..... Within 0.017° mechanical or 1 arc-minute from true position (for CPR>189).

Mechanical

Max Linear Speed .... 3000 FPM not to exceed a maximum shaft speed of 6000 RPM.

Shaft Material ..... Stainless Steel

Radial Shaft Load ..... Up to 10 lb max. Controlled by spring torsion feature

Starting Torque ..... 1.0 oz-in typical with IP50 seal
2.5 oz-in typical with IP66 seal and single wheel
4.0 oz-in typical with IP66 seal and dual wheel
7.0 oz-in typical with IP67 seal and single wheel
14.0 oz-in typical with IP67 seal and dual wheel

Housing ..... Powder coated aluminum

Wheel Width..... 3/4" standard

Weight..... 2.5 lb typical with single wheel
3.0 lb typical with dual wheel

Environmental

Storage Temp ..... -25° to 85° C

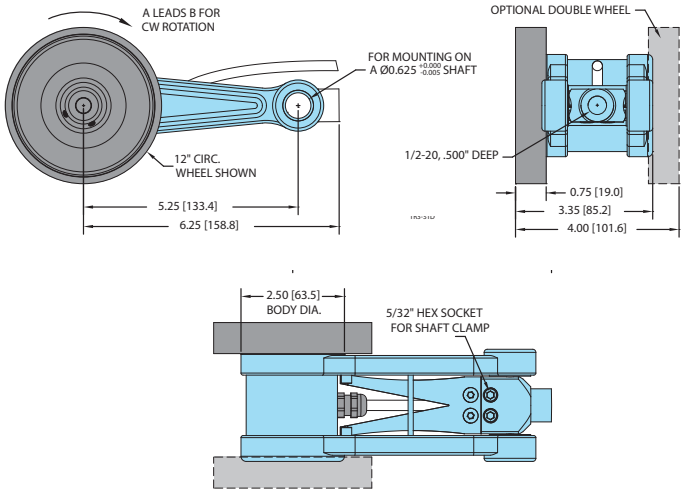
Humidity..... 98% RH non-condensing

Vibration..... 10 g @ 58 to 500 Hz

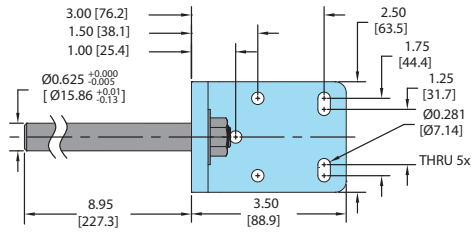
Shock..... 80 g @ 11 ms duration

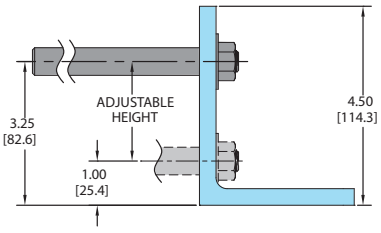
Sealing..... IP50 standard; IP66 or IP67 optional

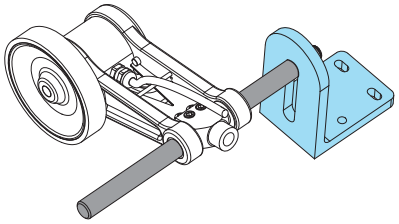
MODEL TR3 HEAVY DUTY TRU-TRAC™



MODEL TR3 MOUNTING BRACKET



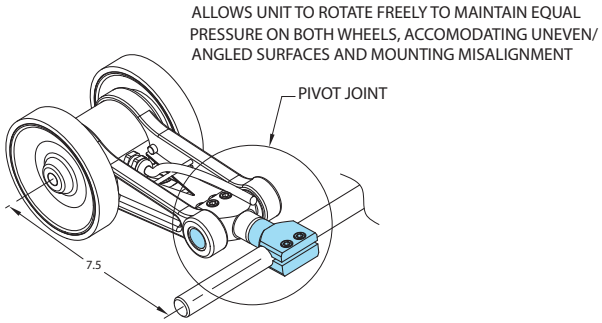


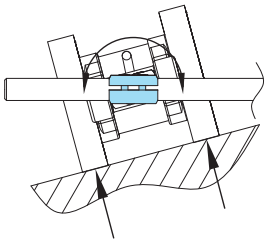


Optional Accessory Mounting Bracket (stock #176389-01) for TR3 Heavy Duty Tru-Trac™ can be ordered separately.

MODEL TR3 HEAVY DUTY TRU-TRAC™

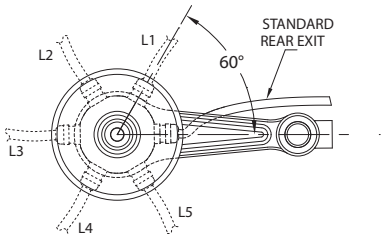
MODEL TR3 DOUBLE WHEEL PIVOT





Optional Accessory Double Pivot Kit (stock #176391-01) for TR3 Heavy Duty Tru-Trac™ can be ordered separately.

MODEL TR3 CONNECTOR ORIENTATION



WIRING TABLE

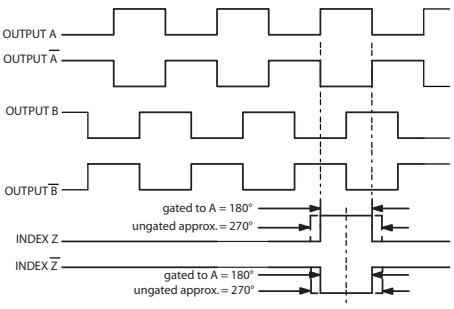
For EPC-supplied mating cables, refer to wiring table provided with cable.
Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	5-pin M12**	8-pin M12**	10-pin MS	7-pin MS HV, OD	7-pin MS PU, PP, OC	6-pin MS PU, PP, OC
Com	Black	3	7	F	F	F	A, F
+VDC	White	1	2	D	D	D	B
A	Brown	4	1	A	A	A	D
A'	Yellow	--	3	H	C	--	--
B	Red	2	4	B	B	B	E
B'	Green	--	5	I	E	--	--
Z	Orange	5	6	C	--	C	C
Z'	Blue	--	8	J	--	--	--
Case	--	--	--	G	G	G	--
Shield	Bare*	--	--	--	--	--	--

*CE Option: Cable shield (bare wire) is connected to internal case.
†Standard cable is 24 AWG conductors with foil and braid shield.
**CE Option: Use cable cordset with shield connected to M12 connector coupling nut.

WAVEFORM DIAGRAM

Incremental Signals



CLOCKWISE ROTATION AS VIEWED FROM THE SHAFT SIDE (FOR UNITS WITH DUAL WHEELS, ORIENT THE ENCODER SO THAT THE LABEL IS READABLE).

NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS $\overline{A}$, B, $\overline{Z}$ FOR HV OUTPUT ONLY.

MEASURING WHEELS

Increasing the Versatility of Encoders

While using an encoder with a measuring wheel has many advantages, it can also be challenging to assemble and put into use. EPC has decades of experience helping customers solve their linear measurement needs with our Tru-Trac™ series, a family of integrated units that bring together a rotary encoder, precision measuring wheel, and spring-loaded torsion arm into a single, easy-to-use package. See pages 126 - 128 for measuring wheels and other measuring wheel options.

A selection of measuring wheels available from EPC, including two different urethane, hard anodized knurled aluminum, and rubber insert

Size/Speed

The wheel's circumference should give the best accuracy possible within the mounting constraints. EPC offers many different measuring wheel sizes, including, but not limited to: 6", 12", 1/3 meter, 200 mm. Also, make sure the encoder can handle both the mechanical and electrical speed of your application. For Instance, EPC Models TR1 and TR3 can handle applications with linear speeds up to 3000 feet per minute and electrical frequencies up to 1 MHz.

Selecting the Proper Measuring Wheel Surface

When selecting a measuring wheel surface, consider these general guidelines:

- Wheel material will expand and contract with temperature variations.
- Wheels wear down with usage.
- A harder wheel surface generally provides greater durability, but less traction.
- Dual wheels result in twice the traction, reducing the potential for wheel slippage (dual wheels only available with Model TR3).

Encoder Products Company offers numerous measuring wheels in different sizes, all made of high grade aluminum alloy. There are four different contact surfaces available.

Rubber Insert

Rubber provides better traction in most applications, but also may wear faster than other materials, depending on the application. The nature of replaceable O-rings allows easy completion of regularly scheduled maintenance. Rubber insert wheels are good for materials such as (but not limited to): paper, film, foil, hard plastic, and other smooth materials.

Polyurethane

This smooth, versatile material comes in different durometer ratings (that is, degrees of hardness). Polyurethane is good for materials such as (but not limited to): metal pipe, sandpaper, matting, cardboard/packaging, belting, insulated wire, metal, etc.

Knurled Aluminum

Knurled aluminum offers good traction, but should not be used with delicate materials. It is a good choice for materials such as (but not limited to): metal pipe, sandpaper, matting, cardboard/packaging, belting, insulated wire, metal, coarse fabric, cloth tape, rubber, rough wood, carpet, foam, insulation, or other rugged materials that won't damage easily from constant contact with the wheel.

Hard Anodized Knurled Aluminum

Anodizing hardens the aluminum and prevents corrosion, so these wheels are good for harsh environments where there may be washdown or exposure to corrosive elements. These wheels are also not meant for delicate materials, and are excellent for materials such as (but not limited to): coarse fabric, wood (i.e., lumber cut-to-length), or other durable materials.

For long service life, choose a measuring wheel encoder that will withstand the environment in which it will be exposed. All measuring wheels, like EPC's Accu-Coder™ brand encoders, are manufactured to EPC's exacting standards, and feature EPC's 3-year standard product warranty, ensuring years of trouble free use.

MODEL LCE

FEATURES

Low Cost Linear Solution
Resolutions from 2-500 Cycles per Inch
IP65 Sealing Available
Cable Measurement 0 - 50 inches

The Linear Cable Encoder (LCE) provides a low cost alternative for obtaining accurate linear measurements. As opposed to typical rotary shaft style encoders, the LCE has a retractable stainless steel cable, allowing for numerous measuring configurations. You can place the LCE away from harsh environmental conditions, while still providing precise measurements, giving the LCE an outstanding advantage over shaft-style encoders. Installation is easy with a variety of cable exit directions, and perfect parallel alignment is no longer necessary. The heart of the LCE is the popular Cube Accu-Coder™, the original cube style encoder. The LCE provides a reliable digital pulse train in either single channel or quadrature format, with resolutions down to 0.002" per cycle. The small overall size, a variety of resolutions, and many different connector types, makes the versatility of the LCE unbeatable.

COMMON APPLICATIONS

Robotics, Extrusion Presses, Valve Positioning, Textile Machinery, Control Gate Positioning

MODEL LCE ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

LCE01 – 1 – 002 – Q – PU – S

MODEL
LCE01 Standard
LCE02 IP65 (Industrial)

CABLE EXIT
1 Option 1
2 Option 2
3 Option 3
4 Option 4

CYCLES PER INCH
See chart below
Price adder for CPI >100

NUMBER OF CHANNELS
Q Quadrature A & B
R Quadrature A & B with Index Z

OUTPUT TYPE
OC Open Collector
PU Pull-Up Resistor
PP Push-Pull
HV Line Driver[1]

CONNECTOR TYPE[2]
S Standard 6-pin MS
Y 7-pin MS
X 10-pin MS
J 5-pin M12 (12 mm)[1]
K 8-pin M12 (12 mm)
G Gland Nut, 18" cable[3]
T Solder Terminal
B Solder Terminal with Conduit Box

Model LCE features.a retractable stainless steel cable at a standard length of 50". Longer lengths may be available, please contact Customer Services.

MODEL LCE RESOLUTION TABLE

Cycles Per Inch	002	020	040	050	100	200	250	500
Resolution	0.500"	0.050"	0.025"	0.020"	0.010"	0.005"	0.004"	0.002"

Contact Customer Service for other resolutions.

NOTES:
1 Line Driver not available with 5-pin M12 connector.
2 For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
3 For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: G/6=6 feet of cable.

MODEL LCE SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 85° C
4.75 to 24 VDC for temperatures between 85° and 100° C
Input Current ..... 80 mA maximum with no output load
Input Ripple..... 100 mV peak-to-peak at 0 to100 kHz
Output Format..... Incremental – Square wave with channel A leading B during linear extension
Output Type..... Open Collector- 250 mA max per channel
Pull-Up – Open Collector with 1.5K ohm internal resistor, 250 mA max per channel
Push-Pull – 20 mA max per channel
Line Driver – 20 mA max per channel (Meets RS 422 at 5 VDC supply)
Index ..... Once per 5" cable extension or retraction
Max Frequency ..... 0 to 125 kHz
Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.

Quadrature..... 67.5° electrical or better is typical,
Edge Separation 54° electrical minimum at temperatures > 99° C

Rise Time..... Less than 1 microsecond

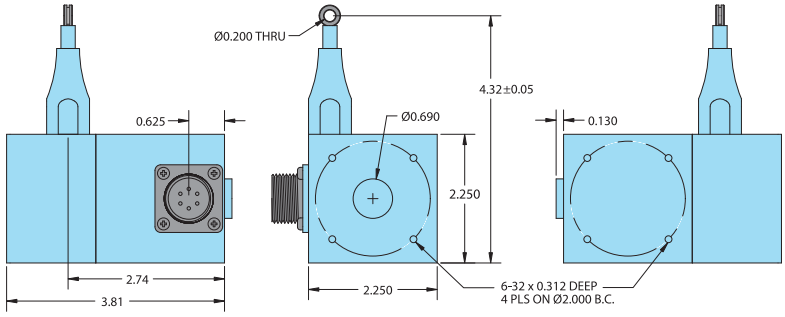
Mechanical

Full Stroke ..... 50" standard. Longer measuring ranges
Length (FSL) may be available, please contact Customer Service.
Finish ..... Black powder coated aluminum
Accuracy..... ±0.10% of FSL
Repeatability ..... ±0.015% of FSL
Linear Resolution..... Up to 500 cycles per inch (0.002" per cycle)
Cable Material..... 0.034" nylon coated stainless steel rope
Cable Tension ..... 20 oz maximum typical
Life (cycles)..... 1,000,000 predicted at zero angle cable exit
Weight..... 19 oz typical

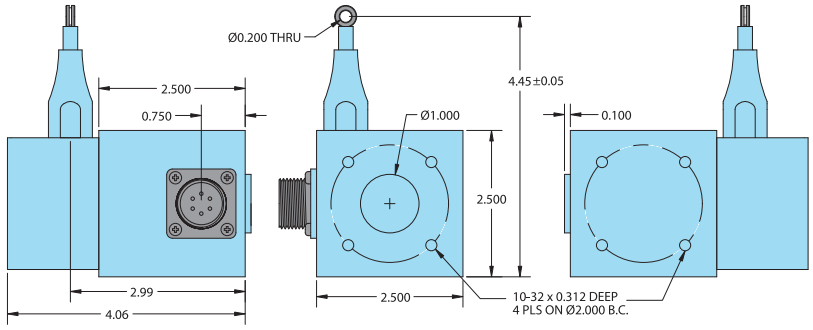
Environmental

Sealing..... IP65 for Industrial LCE

MODEL LCE STANDARD HOUSING (LCE01)

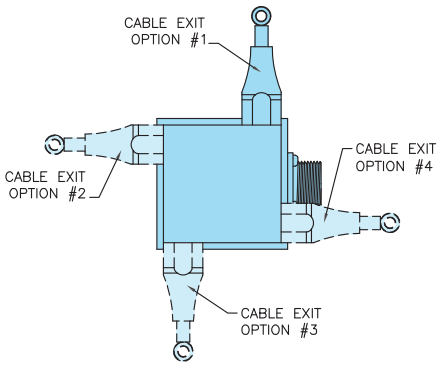


MODEL LCE IP65 INDUSTRIAL HOUSING (LCE02)

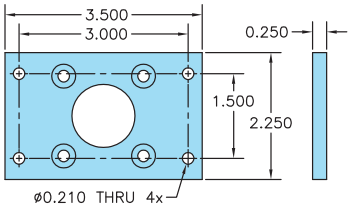


All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

CABLE EXIT OPTIONS



Optional Mounting Plate
Attaches to Standard or Industrial LCE in three different orientations. Order Accessory Item #176064-01.



WIRING TABLE

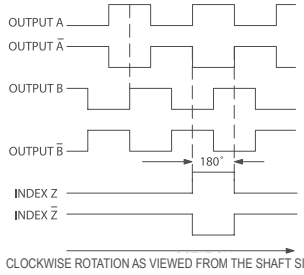
For EPC-supplied mating cables, refer to wiring table provided with cable. Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	5-pin M12	8-pin M12	10-pin MS	7-pin MS HV	7-pin MS O, S, PP	6-pin MS HV, No Index	6-pin MS O, S, PP	Term. Block HV, No Index	Term Block O, S, PP
Com	Black	3	7	F	F	F	A	A, F	1	1, 6
+VDC	Red	1	2	D	D	D	B	B	2	2
A	White	4	1	A	A	A	C	D	3	4
A'	Brown	--	3	H	C	--	D	--	4	--
B	Blue	2	4	B	B	B	E	E	5	5
B'	Violet	--	5	I	E	--	F	--	6	--
Z	Orange	5	6	C	--	C	--	C	--	3
Z'	Yellow	--	8	J	--	--	--	--	--	--
Case	Green	--	--	G	G	G	--	--	--	--
Shield	Bare	--	--	--	--	--	--	--	--	--

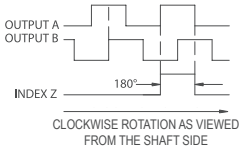
*E-Cube only.
†Standard cable is 24 AWG conductors with foil and braid shield.

WAVEFORM DIAGRAMS

Line Driver and Push-Pull



Open Collector and Pull-Up



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV OUTPUT ONLY.

SPECIFYING OUTPUT TYPES FOR INCREMENTAL ENCODERS

Choosing the correct number of channels and the correct output type for an encoder can be the determining factor in whether or not a feedback system functions properly. There are four common output types to select from, and most of EPC's encoder models can be ordered with any of these four types. There are also some speciality output types, available on select models.

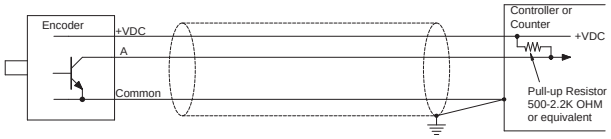
Determining What Output Type Your Application Needs

The receiving device determines the correct configuration of the encoder's outputs. One type of output is not necessarily better than another; it depends on the individual application and the controller being used with the encoder. For instance, if the controller calls for "compatible NPN" output circuitry, a simple open-collector output type is the right choice. The circuit will be current sinking, and the load on the controller side will pull up the encoder output to the desired voltage. In another example, if the controller is set up to receive differential signals, for better noise immunity (especially at higher voltages), use an encoder with an HV differential line driver output. Reference your controller's manual for specific information on its requirements, and of course, EPC Technical Services is here to help if you still have questions.

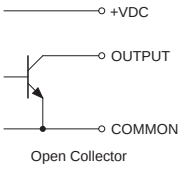
Common Output Types

1. "OC" NPN Open-Collector is a current sinking output and is useful for doing what is called level shifting. This is when the encoder is powered with on e voltage level, and the output is pulled up externally to a different voltage level. For example, the encoder can be powered with 5 volts DC and the output can be pulled up to a 24 volt DC level.

2. "PU" Pull-Up is the same as the open-collector, but, as the name implies, it also contains an internal pull-up resistor to the positive supply voltage supplied to the encoder. (Not to be confused with a "sourcing" type output.) The amount of current that can be sourced with the output transistor in the off state is limited by the supply voltage and the value of the internal pull-up resistor. Common values for the internal pull-up resistor used in encoder is between 1,500 and 2,200 Ω. This type of output is used when the counter, or PLC does not have built-in provisions to pull up the input circuitry.

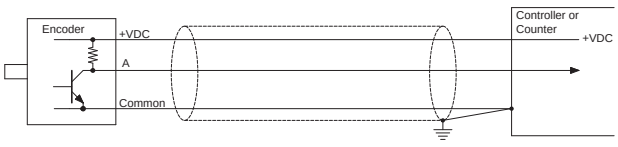


NPN Electrical Hook-Up

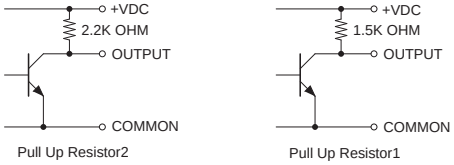


OC Output Circuit

3. "PP" Push-Pull is sometimes referred to as a "totem-pole" type of output circuit. For our discussion here, we will treat them equally. This is a combination of sinking and sourcing outputs. When the output is in the logic high state, current is sourced to the load. When the output is in the logic low state, current is sinked from the load. It suffers from lack of noise immunity, however, because when the output is high (sourcing) whatever noise, ripple, etc., that is on the DC supply lines to the encoder is directly dumped into the input circuitry of the counter, PLC, or whatever the load. When the output is sinking (low state), the noise immunity is the same as if the open-collector was used.

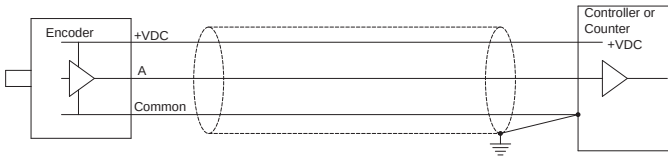


PU Electrical Hook-Up

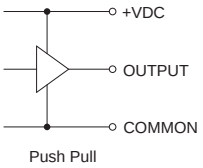


PU Output Circuit

4. “HV” Differential Line Driver provides differential outputs, or complementary signals for noise immunity. It meets RS-422 standards when operated at 5 volts DC. This type of output should be selected if the load device is set up to receive differential signals. The output lines are electrically balanced and if the proper balance between them is not maintained, ringing and spurious oscillations can occur on the lines. At higher frequencies it may cause false counting in the load device. Noise immunity is obtained by the nature of what is called “common mode” rejection. (For more information, see white paper *WP-2005: Noise Suppression of Differential Signals*.) Remember that for each output channel the encoder has, one additional wire in the cable must be used for the complement signal. Also, for applications where there will be long lengths of interconnecting cable, which can degrade the signal, HV is the best option to ensure a clear signal.



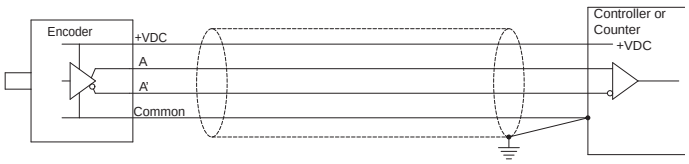
PP Electrical Hook-up



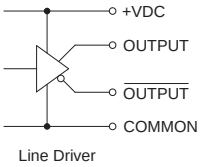
PP Output Circuit

Specialty Output Types

The following output types are available on select EPC encoder models:



HV Electrical Hook-Up



HV Output Circuit

“OD” Open Collector/Differential: an open collector output with complimentary channels similar to a line driver.

“LO” Line Driver on ABZ and Open Collector on UVW: Complimentary line drivers outputs for the clock channels A, B, and Z. Open collector outputs for the commutation channels U, V, W.

“H5” Line Driver at +5VDC: Regardless of the input voltage, the outputs will be limited to +5VDC complimentary line driver. Input voltage is limited to 8-28 VDC for Models 702, 725, 758, 802, and 755.

“P5” Push-Pull at +5VDC: Regardless of the input voltage, the outputs will be limited to +5VDC Push-Pull.

Other Common Industry Terminology

Output types are also referred to in the industry as “HTL”, “TTL”, “PNP”, and many others. Sometimes the output IC (7272, 4469, 8830, 7406, 3904, 26LS31, etc.) is all that is used to define the output type.

If the output type you need is not discussed here or is otherwise unclear, or if you have any additional questions, please contact EPC Technical Service at 800-366-5412 or email sales@encoder.com.

MODEL 15T/H

Ø1.5"

FEATURES

High Performance Economical Encoder
Low Profile – 1.0" (25.4 mm) Height and 1.5" (38 mm) Diameter
Thru-Bore or Hollow Bore (Blind) with sizes up to 0.375" (10 mm)
Simple, Innovative Flex Mounting System (Global Mounting Standards)
Up to 12 Pole Commutation Optional for Brushless Motor Control

The Model 15T or 15H Accu-Coder™ offers a high performance feedback solution in a low profile package. Unlike modular or kit encoders, the Model 15 utilizes an integral bearing set and an innovative flexible mounting system, which are much more tolerant to axial misalignment or radial shaft runout. The slotted flex mounts provide 20 to 30 degrees of rotational adjustment for commutation or index pulse timing. Installation is quick and easy; for brushless servo motor applications, three 120° electrical phase tracks can provide up to 12 pole commutation feedback. The optional 100° C and 120° C temperature options allow servo motors to operate at higher power outputs and duty cycles. With its stable and reliable operation, the Model 15 is an excellent replacement modular encoder when you need a high-performance solution.

COMMON APPLICATIONS

Servo Motor Control, Robotics, Specialty Assembly Machines, Digital Plotters, High Power Motors

MODEL 15T/H ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Mechanical | Electrical | Optional Features (Leave Blank for Standard Options: -20° to 85° C Std | IP50 Std | None Std)

15T	–	01	SF	–	0500	N	5	A	OC	–	F00	–				

MODEL
15T Thru-Bore
15H Hollow Bore (Blind)

BORE SIZE[1]
15 3/16", 0.1875"
01 1/4", 0.250"
03 5/16", 0.3125"
02 3/8", 0.375"
08 4 mm
06 5 mm
04 6 mm
14 8 mm
05 10 mm

MOUNTING
SF 1.812" (46 mm) Slotted Flex-Mount
SA 1.812" (46 mm) Two Hole Flex Mount
SB 1.142" (29 mm) Slotted Flex Mount[2]
SC 1.2795" (32.5 mm) Slotted Flex Mount[2]
SD 1.575" (40 mm) Slotted Flex Mount[2]

CYCLES PER REVOLUTION
See CPR Options below
Price adder for CPR>1999

COMMUTATION[3]
N No Commutation
A 4 Pole
B 6 Pole
C 8 Pole
E 10 Pole
D 12 Pole

INPUT VOLTAGE
5 5 VDC
V1 5 to 28 VDC

NUMBER OF CHANNELS[4]
A Channel A
Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index
Channel B Leads A[5]
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index

OUTPUT TYPE
OC Open Collector
PP Push-Pull
HV Line Driver
PU Pull-Up Resistor[6]
OD Open Collector with Differential Outputs
Available on special request.
Additional lead times may apply:
LO Line Driver on ABZ
Open Collector on UVW[6]

CONNECTOR TYPE[7]
F00 18" Cable[8] (Std)
F01 12" Cable
F02 24" Cable
F03 36" Cable
M00 2M Cable[9]
J00 18" Cable with 5-pin M12[10]
K00 18" Cable with 8-pin M12[10]
A00 15-pin Header with 18" Cable[11]

MAXIMUM FREQUENCY
Standard
F3 Extended
See Specifications

OPERATING TEMPERATURE
-20° to 85° C (Std)
T1 -40° to 85° C
T2 -20° to 100° C
T3 -20° to 120° C[12]
T7 -40° to 120° C[12]

SEALING
IP50 (Std)
S1 IP64 for Thru-Bore & Blind Hollow Bore

CERTIFICATION
None (Std)
CE CE Marked[13]

MODEL 15T/H CPR OPTIONS

0001 thru 0189	0198	0200	0250	0256	0300	0315	0360	
0400	0500	0512	0580	0600	0750	0800	1000	1024
1200	1250	1500	1800	2000	2048	2500	2540	3000
3600	4000	4096	5000	6000	7200	8192	10,000	

New CPR values are periodically added to those listed. Contact Customer Service to determine all currently available values. Special disk resolutions are available upon request and may be subject to a one-time NRE fee.

NOTES:
1 Contact Customer Service for additional options not shown.
2 This mount requires button head screws and a modified Hex wrench. Order appropriate Installation Kit listed under Specifications.
3 Not available in all configurations, and not available with V1 Input Voltage. Contact Customer Service for availability.
4 Contact Customer Service for non-standard index gating or phase relationship options.
5 Reverse Quadrature not available with PU output type.
6 With Input Voltage above 16 VDC, operating temperature is limited to 85° C.
7 For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
8 For non-standard English cable lengths enter 'F' plus cable length expressed in feet. Example: F06 = 6 feet of cable. Frequency above 300 kHz standard cable lengths only.
9 For non-standard metric cable lengths enter 'M' plus cable length expressed in meters. Example: M06 = 6 meters of cable.
10 Not available with commutation. 5-pin not available with Line Driver (HV, OD, LO) outputs. Additional cable lengths available. Please consult Customer Service.
11 Pin Header available with 5 VDC Input Voltage, HV Line Driver and standard quadrature phasing only. Not available with CE Certification. IP50 sealing option only.
12 Only available with 5 VDC Input Voltage.
13 Please refer to Technical Bulletin *TB100: When to Choose the CE Mark* at encoder.com.

MODEL 15T/H SPECIFICATIONS

Electrical

Input Voltage..... 5 VDC ±10% Fixed Voltage
4.75 to 28 VDC max for temperatures up to 85° C
4.75 to 24 VDC for temperatures between 85° and 100° C

Input Current ..... 140 mA max (65 mA typical for most configurations) with no output load

Output Format..... Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mounting face. See *Waveform Diagrams*.

Output Types..... Open Collector – 20 mA max per channel
Push-Pull – 20 mA max per channel
Pull-Up – Open Collector with 2.2K ohm internal resistor, 20 mA max per channel
Line Driver – 20 mA max per channel
(Meets RS 422 at 5 VDC supply)

Index..... Once per revolution
1 to 189 CPR: Ungated
190 to 10,000 CPR: Gated to output A
See *Waveform Diagrams.*

Max. Frequency ..... Standard Frequency Response is
200 kHz for CPR 1 to 2540
500 kHz for CPR 2541 to 5000
1 MHz for CPR 5001 to 10,000
Extended Frequency Response (optional) is 300 kHz for CPR 2000, 2048, 2500, and 2540

Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.

Noise Immunity..... Tested to BS EN61000-6-2; BS EN50081-2; BS EN61000-4-2; BS EN61000-4-3; BS EN61000-4-6; BS EN500811

Quadrature..... 67.5° electrical or better is typical,
Edge Separation 54° electrical minimum at temperatures > 99° C

Waveform Symmetry... 180° (±18°) electrical (single channel encoder)

Accuracy..... Within 0.017° mechanical or
1 arc-minute from true position (for CPR > 189)

Commutation..... Up to 12 pole. Contact Customer Service for availability.

Comm. Accuracy ..... 1° mechanical

Mechanical

Max Shaft Speed..... 8000 RPM. Higher speeds may be achievable, contact Customer Service.

Bore Tolerance ..... -0.0000" / +0.0006"

User Shaft Tolerances
Radial Runout ..... 0.008" max
Axial Endplay..... ±0.030" max

Starting Torque ..... IP50 Hollow Bore: 0.2 oz-in
IP50 Thru-Bore: 0.3 oz-in
IP64: 0.6 oz-in

Moment of Inertia ... 6.7 x 10^{-5} oz-in-sec^2 (4.8 gm-cm^2)

Weight..... 3 oz typical

Environmental

Storage Temp ..... -25° to 85° C

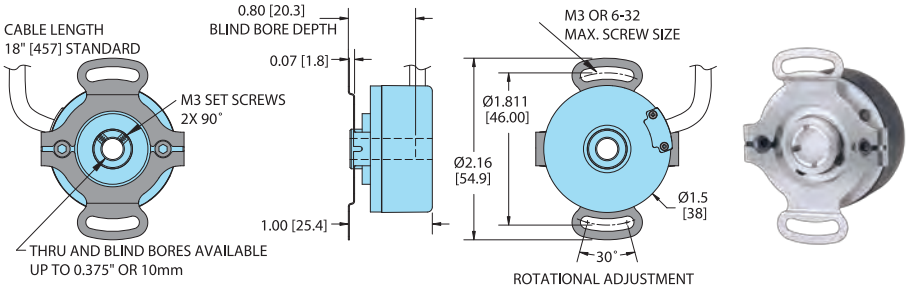
Humidity..... 98% RH non-condensing

Vibration..... 10 g @ 58 to 500 Hz

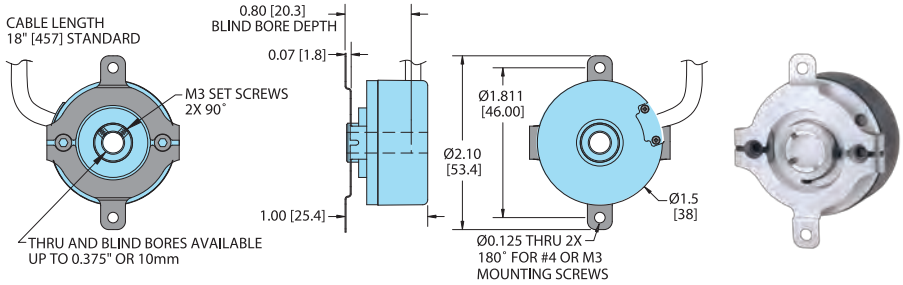
Shock..... 80 g @ 11 ms duration

Sealing..... IP50 standard; IP64 available

MODEL 15T/H 1.811" (46 MM) SLOTTED FLEX MOUNT (SF)

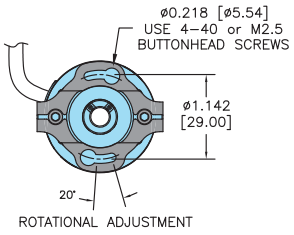


MODEL 15T/H 1.811" (46 MM) TWO HOLE FLEX MOUNT (SA)

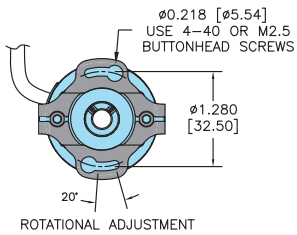


MODEL 15T/H SMALL DIAMETER SLOTTED FLEX MOUNTS

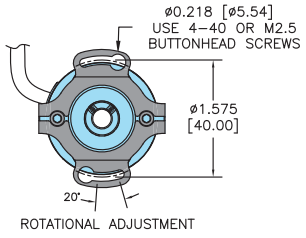
1.142" (29 mm) SB*



1.2795" (32.5 mm) SC*



1.575" (40 mm) SD*



*Order Appropriate No Charge Mounting and Installation Kit for SB, SC, or SD Option. Each kit contains 10 screws for mounting 5 encoders.

176150-01 Installation Kit, 4-40 Buttonhead Screws with 0.062" Shortened Hex Wrench

176149-01 Installation Kit, M2.5 Buttonhead Screws with 1.5 mm Shortened Hex Wrench

Encoder length and diameter are the same as SF and SA mounts detailed above. All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified. Metric dimensions are given in brackets [mm].

SB Slotted Flex Mount

MODEL 15T/H

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable. Trim back and insulate unused wires.

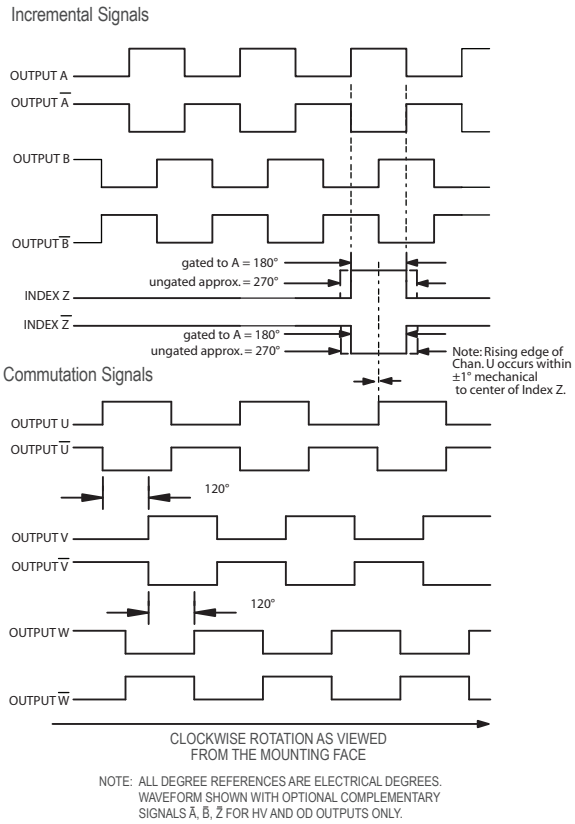
Function	Flying Leads Cable† Wire Color	5-pin M12**	8-pin M12**	15-pin Header
Com	Black	3	7	1
+VDC	White	1	2	2
A	Brown	4	1	4
A'	Yellow	--	3	3
B	Red	2	4	6
B'	Green	--	5	5
Z	Orange	5	6	7
Z'	Blue	--	8	8
U	Violet	--	--	10
U'	Gray	--	--	9
V	Pink	--	--	14
V'	Tan	--	--	13
W	Red/Green	--	--	12
W'	Red/Yellow	--	--	11
Shield	Bare*	--	--	--

*CE Option: Cable shield (bare wire) is connected to internal case.
†Standard cable for non-commutated models is 24 AWG For commutated units, conductors are 28 AWG.
**CE Option: Use cable cordset with shield connected to M12 connector coupling nut.

15-pin Header

Pin 1

WAVEFORM DIAGRAMS



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV AND OD OUTPUTS ONLY.

Cross References

EPC also has a complete line of motor friendly encoders that easily fit motor sizes from small to large.

The Model 15 can be crossed to many encoders. This is not a comprehensive list. Please contact Customer Service for additional offerings and to ensure complete and accurate cross-referencing. For help selecting the correct motor kit for your motor, please contact our encoder experts today.

Visit encoder.com for a product datasheet and to view our full line of replacement encoders. Or contact EPC with your cross-reference request. You'll get a prompt response from an encoder expert that will help you serve your customers better, while reducing your overhead.

MODEL 15S

The Model 15S offers a wide selection of mounting face options. A variety of bosses and bolt hole patterns provide cross-reference adaptability like no other encoder.

M1 – 3x120°
M3 on 1.102" BC
0.787" Dia. Boss
Automation Dir TRDS
Nemicon OEW
Sumtak IRS3
Tamagawa OIS38

M2 – 3x120°
0.547" Dia. Boss
DRC model 150/2/3

M3 - 2.093" Sq. Flange
0.688" Dia. Boss
DRC M2

M4 - 2.093" Dia.
0.688" Dia. Boss
DRC 23
DRC 77L
DRC M2

M5 - 0.8745" Dia. Boss
Dynapar E14

M6 - 0.6875" Dia. Boss
M3x0.5-6H 0.187" Deep
4x1.000" BC
Dynapar E23
Tekel TK-15

M7 - 0.7870" Dia. Boss
M3 0.18" Deep
4x1.181" BC
Nemicon OEW

M8 - 0.7870" Dia. Boss
M3 0.18" Deep
Omron E6B2

M9 - 0.750" Dia. Boss
Can be used with Servo clips
Sumtak LBL

MODEL 15T

The Model 15T (thru-bore) and 15H (hollow bore, or "blind") are the superior choice for your servo or stepper motor applications. Endurance under high-temperature conditions, high resolution performance, commutation, and flexible mounting options make the 15T/H an unbeatable encoder.

SA - 1.811" Bolt
Circle Mounting
DRC 73 DRC T23
DRC 731 Sumtak LBK/LDA

SB - 1.142" (29mm)
Bolt Circle Mounting
Dynapar F14

SC - 1.2795" (32.5mm
Bolt Circle Mounting
Dynapar M14
Renco RCM15

SD - 1.575" (40 mm
Bolt Circle Mounting
Sumtak IRH3
Sumtak IRT3

SF - 1.811" Bolt
Circle Mounting
DRC H15 Renco RCM15
Dynapar M15 Sumtak LBK/LDA
Dynapar M21 Turck 8.3720
Dynapar F14

MODEL 755A

Ø1.5"

FEATURES

Miniature Size (1.5" Diameter)
Up to 30,000 Cycles Per Revolution
Flex Mounting & Large Hollow Bore Option (up to 0.750")
High Temperature Option

The Model 755A Size 15 Accu-Coder™ is ideal for applications requiring a small, high-precision, high-performance encoder. Approximately 1.5" in diameter and 1.5" long, it will fit where many encoders cannot. All metal construction and shielded ball bearings provide years of trouble-free use. A variety of blind hollow bore sizes are available with large bores allowing for shafts up to 0.750" or 14 mm. Attaching directly to a motor is quick and simple with the innovative flex mount, first developed by EPC. This industry-standard mount eliminates couplings and increases reliability, while reducing overall length and cost. Where critical alignment is required, a Slotted Flex (SF) is available. A perfect replacement encoder where high reliability is required.

COMMON APPLICATIONS

Robotics, Assembly Machines, Motor-Mounted Feedback, Phototypesetters, Printers & Digital Plotters, Elevator Controls, Medical Diagnostic Equipment

MODEL 755A ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

755A – 01 – S – 1000 – R – HV – 1 – S – S – CE

MODEL
755A Model 755A

BORE SIZES[1]

15	3/16", 0.1875"	16	4 mm
01	1/4", 0.250"	18	5 mm
03	5/16", 0.3125"	04	6 mm
02	3/8", 0.375"	14	8 mm
10	1/2", 0.500"	05	10 mm
11	5/8", 0.625"	12	12 mm
17	3/4", 0.750"	13	14 mm

OPERATING TEMPERATURE
L -40° to 70° C[2]
S 0° to 70° C
H 0° to 100° C[3]

CYCLES PER REVOLUTION 1-30,000
See *CPR Options* below for available resolutions.
Price adder for CPR >1270

NUMBER OF CHANNELS[4]
A Channel A
Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index
Channel B Leads A
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index

OUTPUT TYPE
5 - 28V In/Out[5]
OC Open Collector
PU Pull-Up Resistor
PP Push-Pull
HV Line Driver[6]
8-28V In/5V Out[7,8]
H5 Line Driver[6]
P5 Push-Pull

MAXIMUM FREQUENCY
1 Standard 100 kHz
2 200 kHz ≤ 3000 CPR
5 250 kHz, >3000 CPR
3 500 kHz, >6000 CPR[9]
4 1 MHz, >10,000 CPR[9]

MOUNTING
S Standard Flex Mount
SF Slotted Flex Mount

CONNECTOR TYPE[10]
S Standard 18" Cable[11]
C01 8-pin Molex
C02 Terminal Block
J00 18" Cable with 5-pin M12[6]
K00 18" Cable with 8-pin M12

CERTIFICATION
N None
CE CE Marked[8,12]

MODEL 755A CPR OPTIONS

0001*	0002*	0004*	0005*	0006*	0007*	0008*	0010*	0011*
0012*	0014*	0020	0021*	0024*	0025*	0028*	0030*	0032*
0033*	0034*	0035*	0038*	0040*	0042*	0045*	0050*	0060
0064*	0100	0120	0125	0128*	0144*	0150*	0160*	0192*
0200	0240*	0250	0254*	0256*	0300	0333*	0360	0400
0500	0512	0600	0625*	0635	0665*	0720	0768*	0800
0889	1000	1024	1200	1201*[a]	1203*[a]	1204*[a]	1250[a]	1270[a]
1440	1500	1800	2000	2048	2400[a]	2500	2540[a]	2880[a]
3000[a]	3600[a]	4000[a]	4096[a]	5000[a]	6000[a]	7200[a]	7500[a]	9000[a]
10,000[a]	10,240[a]	12,000[a]	12,500[a]	14,400[a]	15,000[a]	18,000[a]	20,000[a]	
20,480[a]	25,000[a]	30,000[a]						

*Contact Customer Service for High Temperature Option.
[a]High Temperature Option (H) limited to 85° C maximum for these CPR options.

New CPR values are periodically added to those listed. Contact Customer Service to determine all currently available CPR values. Special disk resolutions are available upon request. A one-time NRE fee may apply.

NOTES:

1 Contact Customer Service for additional options.
2 Low temperature option not available with resolutions of 3000 CPR or higher.
3 0° to 85° C for certain resolutions, see CPR Options.
4 Contact Customer Service for index gating options.
5 24 VDC max for high temperature option.
6 Line Driver outputs not available with 5-pin M12 connector.
7 Standard temperature, 60 to 3000 CPR only. Not available with 2540 CPR.
8 H5 and P5 outputs are not available with CE option.
9 Standard cable lengths only. For details, please refer to Technical Bulletin *TB116: Noise and Signal Distortion Considerations* encoder.com.
10 For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
11 Additional cable lengths available. Please consult Customer Service. For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: S/6 = 6 feet of cable.
12 Please refer to Technical Bulletin *TB100: When to Choose the CE Mark* at encoder.com.

MODEL 755A SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 70° C
4.75 to 24 VDC for temperatures between 70° and 100° C
Input Current ..... 100 mA max with no output load
Input Ripple..... 100 mV peak-to-peak at 0 to 100 kHz
Output Format..... Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mounting face. See *Waveform Diagrams*.
Output Types..... Open Collector – 100 mA max per channel
Pull-Up – Open Collector with 2.2K ohm internal resistor, 100 mA max per channel
Push-Pull – 20 mA max per channel
Line Driver – 20 mA max per channel
(Meets RS 422 at 5 VDC supply)
Index..... Occurs once per revolution. The index for units > 3000 CPR is 90° gated to Outputs A and B. See *Waveform Diagrams*.
Max Frequency ..... Up to 1 MHz
Electrical Protection ..... Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.
Noise Immunity..... Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN50081-2
Symmetry..... 1 to 6000 CPR: 180° (±18°) electrical at 100 kHz output
6001 to 20,480 CPR: 180° (±36°) electrical
Quad Phasing..... 1 to 6000 CPR: 90° (±22.5°) electrical at 100 kHz output
6001 to 20,480 CPR: 90° (±36°)
Min Edge Sep..... 1 to 6000 CPR: 67.5° electrical at 100 kHz output
6001 to 20,480 CPR: 54° electrical
> 20,480 CPR: 50° electrical
Rise Time..... Less than 1 microsecond
Accuracy..... Instrument and Quadrature Error:
For 200 to 1999 CPR, 0.017° mechanical (1.0 arc minutes) from one cycle to any other cycle. For 2000 to 3000 CPR, 0.01° mechanical (0.6 arc minutes) from one cycle to any other cycle. Interpolation error (units > 3000 CPR only) within 0.005° mechanical. (Total Optical Encoder Error = Instrument + Quadrature + Interpolation)

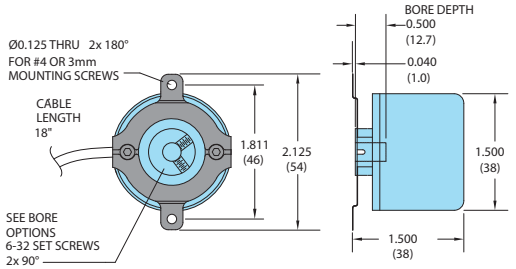
Mechanical

Max Shaft Speed..... 7500 RPM. Higher shaft speeds may be achievable, contact Customer Service.
Bore Tolerance ..... -0.0000" / +0.0006"
User Shaft Tolerances
Radial Runout ..... 0.007" max
Axial End Play..... ±0.030" max
Starting Torque ..... 0.14 oz-in typical
4.0 oz-in typical for -40° C operation
Moment of Inertia ... 2.8 x 10^{-4} oz-in-sec^2
Housing ..... Black non-corrosive finish
Bearings..... Precision ABEC ball bearings
Weight..... 3.50 oz typical

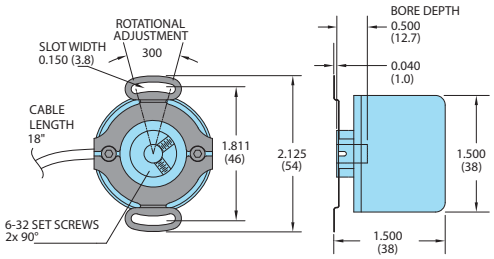
Environmental

Storage Temp ..... -25° to 85° C
Humidity..... 98% RH non-condensing
Vibration..... 10 g @ 58 to 500 Hz
Shock..... 50 g @ 11 ms duration

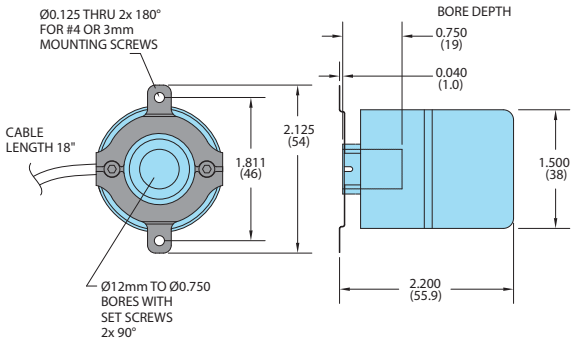
MODEL 755A FLEX MOUNT (S)



OPTIONAL SLOTTED FLEX MOUNT (SF)



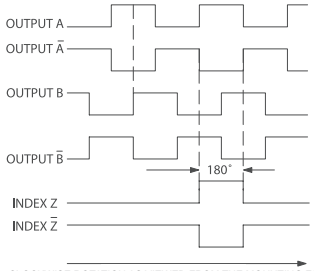
MODEL 755A LARGE BORE FLEX MOUNT (S)



All dimensions are in inches with a tolerance of +0.005" or +0.01" unless otherwise specified. Metric dimensions are given in brackets [mm].

WAVEFORM DIAGRAMS

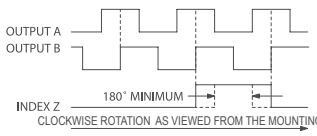
Line Driver and Push-Pull



CLOCKWISE ROTATION AS VIEWED FROM THE MOUNTING FACE

NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV OUTPUT ONLY.

Open Collector and Pull-Up



CLOCKWISE ROTATION AS VIEWED FROM THE MOUNTING FACE

NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. INDEX IS POSITIVE GOING.

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable. Trim back and insulate unused wires.

Function	Flying Leads Cable† Wire Color	Terminal Block	8-pin Molex	5-pin M12**	8-pin M12**
Com	Black	7	2	3	7
+VDC	White	8	1	1	2
A	Brown	1	8	4	1
A'	Yellow	2	7	--	3
B	Red	3	4	2	4
B'	Green	4	3	--	5
Z	Orange	6	6	5	6
Z'	Blue	5	5	--	8
Shield	Bare*	--	--	--	--

*CE Option: Cable shield (bare wire) is connected to internal case.
†Standard cable is 24 AWG conductors with foil and braid shield.
**CE Option: Use cable cordset with shield connected to M12 connector coupling nut.

MODEL 260

Ø2.0"

FEATURES
Low Profile 1.19"
Up to 12 Pole Commutation
Available in Thru-Bore and Hollow Bore (Blind)
Simple, Innovative Flexible Mounting System
Incorporates Opto-ASIC Technology
CE Marking Available

With a bore up to 0.625" and a low profile, the Model 260 Accu-Coder™ is the perfect solution for many machine and motor applications. Available in both hollow bore and a complete thru-bore, the Model 260 uses EPC's innovative anti-backlash mounting system, allowing simple, reliable, and precise encoder attachment. Unlike traditional kit or modular encoder designs, its integral bearing set provides stable and consistent operation without concerns for axial or radial shaft runout. For brushless servo motor applications, the Model 260 can be specified with three 120° electrical phase tracks to provide up to 12 pole commutation feedback. The optional extended temperature capability allows servo motors to operate at higher power outputs and duty cycles. And of course, the Model 260 uses EPC's pioneering Opto-ASIC design, so you'll always get a clean, reliable signal.

COMMON APPLICATIONS
Brushless Servo Motor Commutation, Robotics, Motor-Mounted Feedback, Assembly Machines, Digital Plotters, High Power Motors

MODEL 260 ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

260 – N – T – 01 – S – 0256 – Q – OC – 1 – S – SF – 1 – N

MODEL
260 Ultra Versatile Commutated Thru-Bore

COMMUTATION[1]
N No Commutation
C4 4 Pole
C6 6 Pole
C8 8 Pole
C10 10 Pole
C12 12 Pole

HOUSING STYLE
B Hollow Bore (Blind)
T Front Clamp Thru-Bore
R Rear Clamp Thru-Bore

BORE SIZE[2]
01 1/4", 0.250"
02 3/8", 0.375"
76 7/16", 0.4375"
10 1/2", 0.500"
11 5/8", 0.625"
06 5 mm
04 6 mm
14 8 mm
05 10 mm
09 11 mm
12 12 mm
13 14 mm
15 15 mm

OPERATING TEMPERATURE[3]
L -40° to 70° C
S 0° to 70° C
H 0° to 100° C
V 0° to 120° C[8]

CYCLES PER REVOLUTION
1-10,000
See *CPR Options* below
Price adder > 1999

NUMBER OF CHANNELS[4]
Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index
Channel B Leads A
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index
See http://www.encoder.com/literature/index-phasing.pdf for additional options, and waveforms.

OUTPUT TYPE
OC Open Collector
PP Push-Pull
HV Line Driver[5]
OD Open Collector with Differential Outputs

MAXIMUM FREQUENCY
1 Standard
2 Extended
See specifications for explanation.

CONNECTOR[6] **TYPE**
S 18" Cable[7]
J00 18" Cable with 5-pin M12[8]
K00 18" Cable with 8-pin M12[8]
SMJ 5-pin Body Mount M12[5,8]
SMK 8-pin Body Mount M12[8]
SMH 10-pin Body[9] Mount Bayonet

MOUNTING
SD 1.575" (40 mm) BC Flex Mount
SF 1.811" (46 mm) BC Flex Mount
SL 2.36" (60 mm) BC Flex Mount
XF 2.250" BC 3-point Flex Mount
NF 2.375" BC 3-point Flex Mount
FA 2.12" to 3.62" BC Flex Arm
FB 3.00" to 6.26" BC Flex Arm

SEALING
1 IP50 for Thru-Bore
2 IP64 for Thru-Bore
3 IP64 for Hollow Bore
4 IP50 for Hollow Bore

CERTIFICATION
N None
CE CE Marked[10]

MODEL 260 CPR OPTIONS

0001 thru 0189*		0200	0250	0254	0256
0300	0360	0400*	0500	0512	0600
0720	0800	0840	1000	1024	1200
1250	1270	1500	1800	2000	2048
2500	2540	3000	3600	4000	4096
5000	6000	7200	8192	10,000	

*Contact Customer Service for availability.

Contact Customer Service for other disk resolutions. Not all disk resolutions available with every commutation option.

NOTES:

1 Not available in all configurations. Contact Customer Service for availability.
2 Contact Customer Service for additional options not shown.
3 5 to 16 VDC supply only for H option; 5 VDC supply only for V option. Contact Customer Service for availability and additional information.
4 Contact Customer Service for non-standard index gating options.
5 Line Driver not available with 5-pin Body Mount M12 connector type.
6 For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
7 For non-standard cable lengths add a forward slash (/) plus cable length expressed in feet. Example: S/6 = 6 feet of cable. Frequency above 300 kHz standard cable lengths only.
8 8-pin Body Mount M12 Connector Type not available with commutation or with V temperature option. Additional cable lengths available. Please consult Customer Service.
9 Not available with commutation.
10 Please refer to Technical Bulletin *TB100: When to Choose the CE Mark* at encoder.com.

MODEL 260 SPECIFICATIONS

Electrical

Input Voltage.....4.75 to 28 VDC for temperatures up to 70° C
5 to 16 VDC for 0° to 100° C operating temperature
5 VDC for 0° to 120° C operating temperature

Input Current .....130 mA max (< 100 mA typical) with no output load

Output Format.....Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the mounting face.
See *Waveform Diagrams.*

Output Types.....Open Collector – 20 mA max per channel
Push-Pull – 20 mA max per channel
Line Driver – 20 mA max per channel
(Meets RS 422 at 5 VDC supply)

Index.....Once per revolution gated to channel A. See *Waveform Diagrams.*

Max. Frequency .....Standard Frequency Response is 200 kHz for CPR 1 to 2540
500 kHz for CPR 2541 to 5000
1 MHz for CPR 5001 to 10,000
Extended Frequency Response (optional) is 300 kHz for CPR 2000, 2048, 2500, and 2540

Electrical Protection ..Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.

Noise Immunity.....Tested to BS EN61000-6-2; BS EN50081-2; BS EN61000-4-2; BS EN61000-4-3;
BS EN61000-4-6, BS EN55011

Quadrature.....67.5° electrical or better is typical.

Edge Separation.....54° electrical minimum at temperatures > 99° C

Accuracy.....Within 0.01° mechanical from one cycle to any other cycle, or 0.6 arc minutes.

Commutation.....Up to 12 pole. Contact Customer Service for availability.

Comm. Accuracy.....1° mechanical.

Mechanical

Max Shaft Speed.....7500 RPM. Higher shaft speeds may be achievable, contact Customer Service. Note: For extreme temperature operation, de-rate temperature by 5° C for every 1000 RPM above 3000 RPM.

Bore Tolerance.....-0.0000" / +0.0006"

User Shaft Tolerances
Radial Runout .....0.007" max
Axial Endplay.....±0.030" max

Starting Torque .....IP50 Thru-Bore: 0.50 oz-in
IP50 Hollow Bore: 0.30 oz-in
IP64 Thru-Bore: 2.50 oz-in
IP64 Hollow Bore: 2.0 oz-in
Note: Add 3.0 oz-in for -40° C operation

Moment of Inertia ...3.9 x 10^{-4} oz-in-sec^2

Housing .....Non-corrosive material

Weight.....3.5 oz typical

Environmental

Storage Temp .....-40° to 100° C

Humidity.....98% RH non-condensing

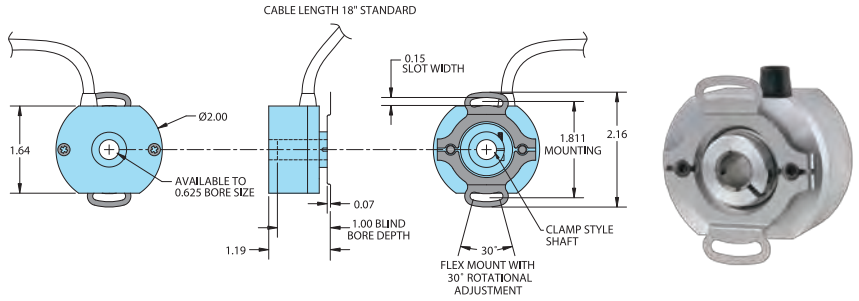
Vibration.....10 g @ 58 to 500 Hz

Shock.....50 g @ 11 ms duration

Sealing.....IP50; IP64 available

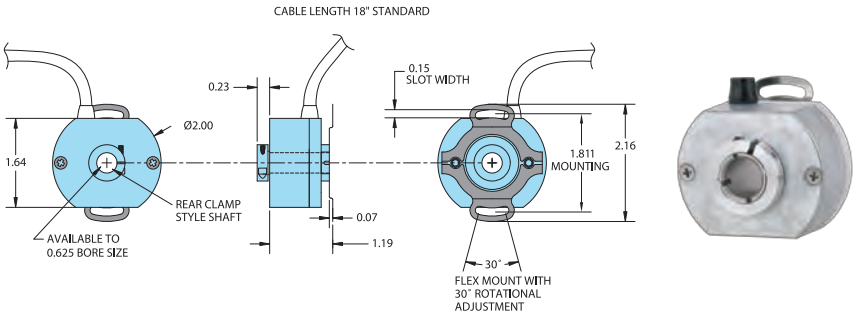
MODEL 260 WITH FRONT SHAFT CLAMP (T)

WITH 1.811" (46 MM) BC SLOTTED FLEX (SF)

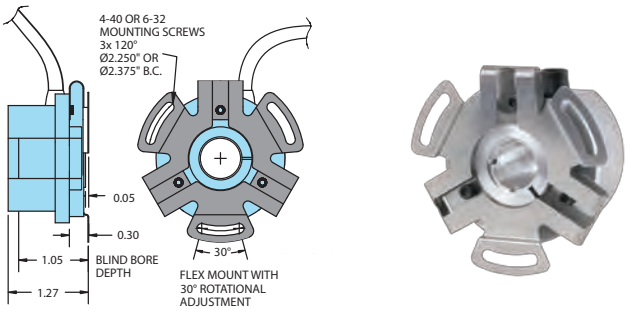


MODEL 260 REAR CLAMP (R)

WITH 1.811" (46 MM) BC SLOTTED FLEX (SF)



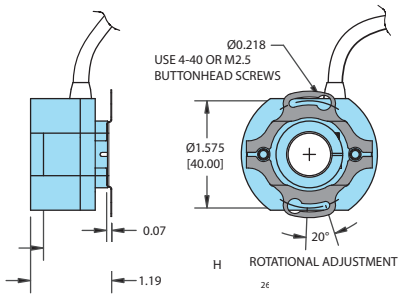
THREE POINT FLEX MOUNT (XF, NF)



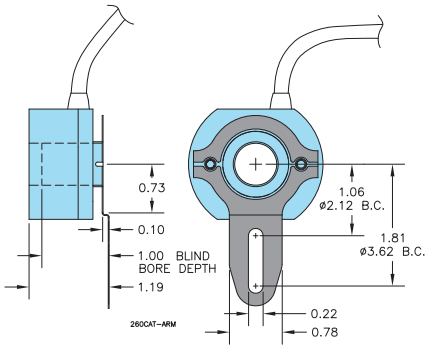
All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

MODEL 260

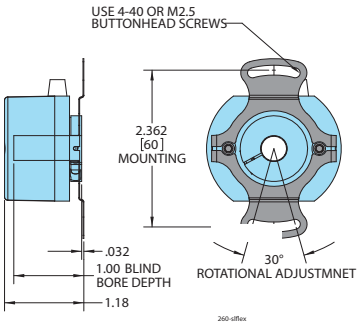
1.575" (40 MM) BC FLEX MOUNT (SD)



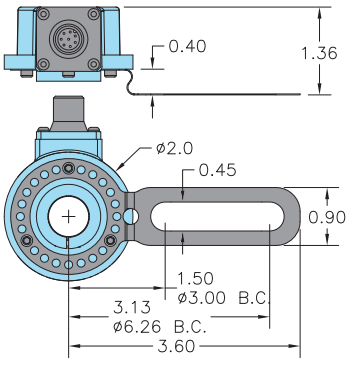
1.06" TO 1.81" FLEX ARM (FA)



2.36" (60 MM) BC FLEX MOUNT (SL)



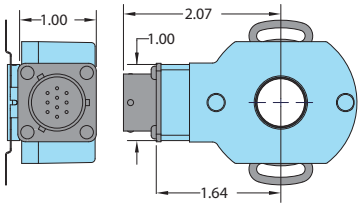
1.50" TO 3.13" FLEX ARM (FB)



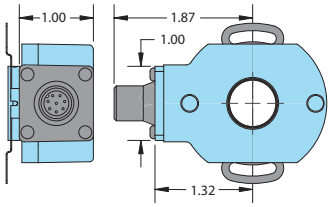
All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

MODEL 260 CONNECTOR OPTIONS

BODY MOUNT 10-PIN BAYONET (SMH)

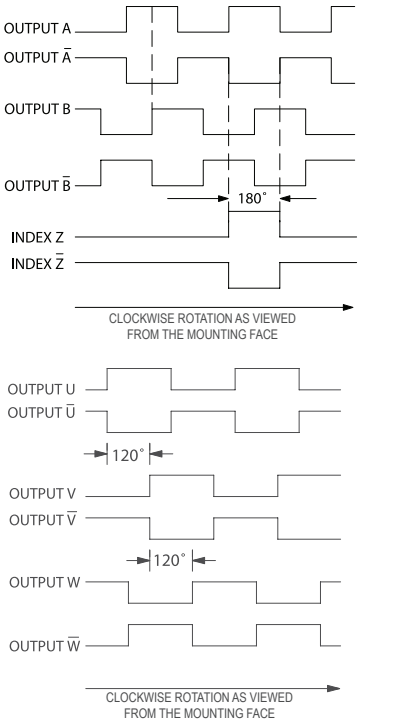


BODY MOUNT M12 (SMJ, SMK)



All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

WAVEFORM DIAGRAMS



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES.WAVE-FORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV AND OD OUTPUTS ONLY.

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable. Trim back and insulate unused wires.

Function	Flying Leads Cable† Wire Colors	5-pin M12**	8-pin M12**	10-pin Bayonet+
Com	Black	3	7	F
+VDC	White	1	2	D
A	Brown	4	1	A
A'	Yellow	--	3	H
B	Red	2	4	B
B'	Green	--	5	J
Z	Orange	5	6	C
Z'	Blue	--	8	K
U	Violet	--	--	--
U'	Gray	--	--	--
V	Pink	--	--	--
V'	Tan	--	--	--
W	Red/Green	--	--	--
W'	Red/Yellow	--	--	--
Shield	Bare*	--	--	--

†Standard cable for non-commutated models is 24 AWG For commutated units, conductors are 28 AWG.
*CE Option: Cable shield (bare wire) is connected to internal case.
**CE Option: Use cable cordset with shield connected to M12 connector coupling nut.
+CE Option: Pin G is connected to internal case.

MODEL 225A/Q

FEATURES
Single Channel & Quadrature Models
Easy to Mount Economical Thru-Bore Design
Metal Construction
Bore Sizes to 0.875" or 22 mm

Controlling motor speed is essential for many production assembly machines or robotic equipment. For tachometer feedback, or motor speed control applications, the Model 225 Accu-Coder™ is the ideal encoder choice. The Model 225 Accu-Coder™ is a thru-bore encoder available in both single channel (225A) and quadrature (225Q) models that provides a cost-effective solution for simple measurement. Features including an all metal housing, a variety of connector options, and easy installation due to the thru-bore design, make the Model 225 Accu-Coder™ ideal for many motion control and manufacturing applications.

COMMON APPLICATIONS
Brushless Servo Motor Commutation, Robotics, Motor-Mounted Feedback, Assembly Machines, Digital Plotters, High Power Motors

MODEL 225A/Q ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

225Q – 10 – 100 – OC – N – N – K

MODEL
225A Single Channel
225Q Quadrature

CYCLES PER REVOLUTION
See *CPR Options* below
225A 1 - 600 CPR
225Q 1 - 100 CPR

OUTPUT TYPE
OC Open Collector
PU Pull-Up Resistor

BORE SIZES

01	1/4", 0.250"	07	7 mm
03	5/16", 0.3125"	05	10 mm
02	3/8", 0.375"	06	11 mm
10	1/2", 0.500"	12	12 mm
56	9/16", 0.562"	14	14 mm
11	5/8", 0.625"	15	15 mm
68	11/16", 0.6875"	16	16 mm
34	3/4", 0.750"	17	17 mm
18	7/8", 0.875"	19	19 mm
		20	20 mm
		22	22 mm

MOUNTING
N No Additional Mounting
F Flex Arm Kit

SEALING
N No Seal (Standard)
Y Bearing Seals[1]

CONNECTOR TYPE[2]
S 6 ft Cable[3]
T Terminal Block
9D 9-pin D-subminiature
J 5-pin M12 (12 mm)
K 8-pin M12 (12 mm)

MODEL 225A/Q CPR OPTIONS

225A
1-600 CPR, all resolutions

225Q

001	002	003	004	005	006	010	011
015	016	020	022	025	030	032	040
048	050	060	062	080	083	090	099
100							

Contact Customer Service for other disk resolutions.

NOTES:
1 Shaft speed limited to 400 RPM.
2 For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
3 For Non-Standard Cable Lengths add a forward slash (/) plus cable length expressed in feet. Example: S/12 = 12 feet of cable.

MODEL 225A SPECIFICATIONS
SINGLE CHANNEL

Electrical

Input Voltage.....4.75 to 24 VDC
Input Current .....32 mA max with Pull-Up option
Input Ripple.....100 mV peak-to-peak at 0 to 100 kHz
Output Format .....Square wave 50% duty cycle
Output Types.....Open Collector – 100 mA max
Pull-Up – Open Collector with 1.5K ohm internal resistor, 20 mA max per channel
Max Frequency .....0 to 6 kHz
Rise Time.....Less than 1 microsecond
Cycles per Rev .....1 to 600

Mechanical

Max. Shaft Speed.....4000 RPM
Bore Tolerance .....Bore H7 fit for g6 shaft Class LC5 per ANSI B-4.I Standard
Running Torque.....10 oz-in typical
Housing .....Black non-corrosive finish
Bearings.....Precision ABEC ball bearings
Weight.....8 oz typical

Environmental

Storage Temp .....-25° to 85° C
Humidity.....95% RH non-condensing
Vibration.....3 g @ 5 to 1000 Hz
Shock.....20 g @ 10 ms duration

MODEL 225Q SPECIFICATIONS
QUADRATURE

Electrical

Input Voltage.....4.75 to 24 VDC
Input Current .....64 mA max with Pull-Up option
Input Ripple.....100 mV peak-to-peak at 0 to 100 kHz
Output Format .....Square wave 50% duty cycle in quadrature
Output Types.....Open Collector – 100 mA max per channel
Pull-Up – Open Collector with 1.5K ohm resistor, 20 mA max per channel
Max Frequency .....0 to 6 kHz
Electrical Protection ..Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.
Rise Time.....Less than 1 microsecond
Cycles Per Rev .....1 to 100

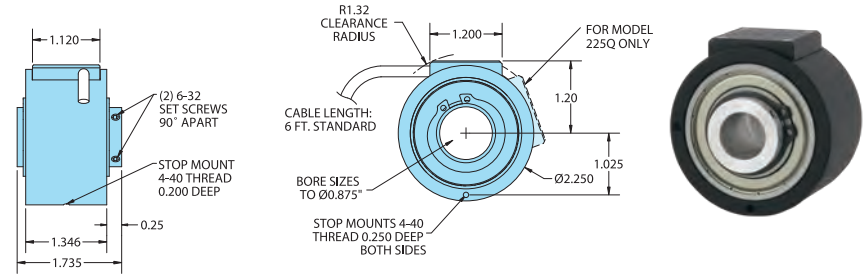
Mechanical

Max. Shaft Speed.....4000 RPM
Bore Tolerance .....Bore H7 fit for g6 shaft Class LC5 per ANSI B-4.I Standard
Running Torque.....10 oz-in typical
Housing .....Black non-corrosive finish
Bearings.....Precision ABEC ball bearings
Weight.....10 oz typical

Environmental

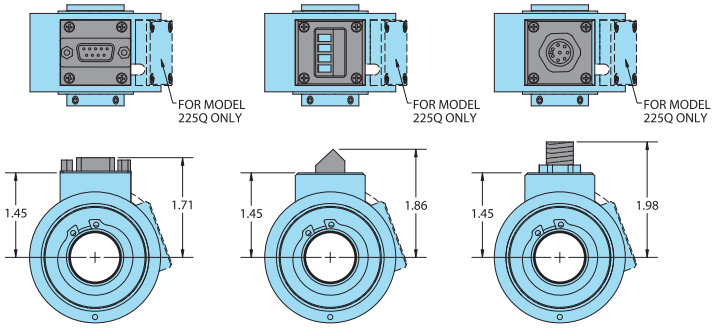
Storage Temp .....-25° to 85° C
Humidity.....95% RH non-condensing
Vibration.....3 g @ 5 to 1000 Hz
Shock.....20 g @ 10 ms duration

MODEL 225



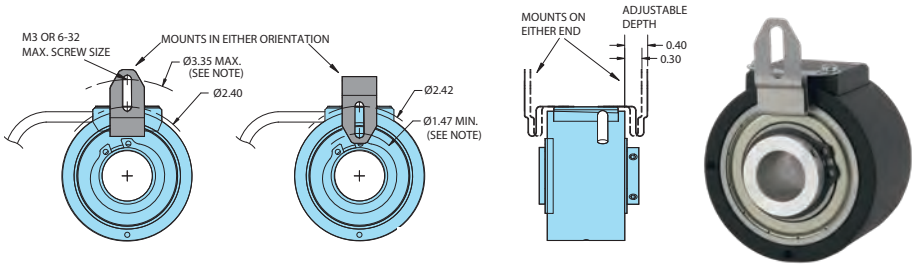
MODEL 225 CONNECTOR OPTIONS

9D 9-pin D-Subminiature
T Terminal Block
J 5-pin M12 (12 mm)
K 8-pin M12 (12 mm)



MODEL 225 MOUNTING OPTION (F) FLEX ARM KIT

To order Model 225 Flexible Mounting Arm Kit as an accessory, order part #140106-01.
Kit may be mounted in either an up or down orientation.



NOTE: FOR ANY CONNECTOR OPTION, THE BOLT CIRCLE RANGE IS FROM Ø1.72" TO Ø3.60" DUE TO THE INCREASED CAP HIEGHT

All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

WIRING TABLE

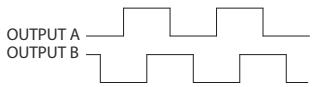
For EPC-supplied mating cables, refer to wiring table provided with cable.

Trim back and insulate unused wires.

Function	Flying Leads Cable† Wire Color	5-pin M12	8-pin M12	Term Block	9-pin D-Sub
Com	Black	3	7	1	9
+VDC	Red	1	2	2	1
A	White	4	1	3	2
B	Green	2	4	4	4
Shield	Bare	--	--	--	--

†Standard cable is 24 AWG conductors with foil and braid shield.

WAVEFORM DIAGRAM
MODELS 225A/Q



NOTE: MODEL 225A INCLUDES OUTPUT A ONLY

MODEL 25T/H

Ø2.5"

FEATURES

2.5" Opto-ASIC Encoder with a Low Profile (2.0")
Standard Bore Sizes Ranging from 0.625" to 1.125"
Metric Bore Sizes Ranging from 6 mm to 28 mm
Single Replacement Solution for 2.0" to 3.5" Encoders
Resolutions to 10,000 CPR; Frequencies to 1 MHz
Versatile Flexible Mounting Options
RoHS Compliant

Representing the next generation of high performance encoders, the Model 25T Accu-Coder™ features the largest thru-bore available in a 2.5" encoder, able to mount directly on shafts as large as 1.125" (28 mm). With resolutions up to 10,000 CPR and frequencies up to 1MHz, this industrial strength encoder is perfect for fast revving motors. The 25T features the next generation of EPC's proprietary Opto-ASIC sensor, which provides superior accuracy and precision counts. The injection molded housing, made from EPC's custom blend of nylon composites, is grooved with "cooling fins" and can tolerate the extreme heat of the motion-control industry. With sealing available up to IP66 and many new rugged flexible mounting options, the Model 25T can perform in demanding industrial environments.

COMMON APPLICATIONS

Motor-Mounted Feedback and Vector Control, Specialty Machines, Robotics, Web Process Control, Paper and Printing, High Power Motors

MODEL 25T/H ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Mechanical | Electrical | Optional Features (Leave Blank for Standard Options: -20° to 85° C Std | IP50 Std | None Std)

25T [ ] – [42] [SE] – [0500] [N] [V1] [R] [OC] – [SMW] – [ ] [ ] [ ]

HOUSING OPTION (Leave Blank for Standard)
- Standard
- C Corrosion Resistant

MODEL
- 25T Thru-Bore
- 25H Hollow Bore (Blind)

BORE SIZE[1]

01	1/4", 0.250"	04	6 mm
03	5/16", 0.3125"	14	8 mm
02	3/8", 0.375"	10	10 mm
05	1/2", 0.500"	09	11 mm
11	5/8", 0.625"	12	12 mm
34	3/4", 0.750"	13	14 mm
78	7/8", 0.875"	15	15 mm
40	1", 1.000"	16	16 mm
42	1-1/8", 1.125"	17	17 mm
		18	18 mm
		19	19 mm
		20	20 mm
		24	24 mm
		25	25 mm
		28	28 mm

MOUNTING
- SE 2.25" to 2.75" B.C. 3-point Flex Mount
- SG 3.50" to 5.90" B.C. (4.5" C-face) Tether Arm Kit
- SJ 3.50" to 8.10" B.C. (8.5" C-face) Tether Arm Kit
- SH 2.72" to 3.42" B.C. (Block & Pin) Tether Arm Kit

CYCLES PER REVOLUTION
See *CPR Options* below
Price Adder for Resolutions Over 2000

INPUT VOLTAGE
- V1 5 to 28 VDC

NUMBER OF CHANNELS[1]

Channel A Leads B
- Q Quadrature A & B
- R Quadrature A & B with Index

Channel B Leads A[2]
- K Reverse Quadrature A & B
- D Reverse Quadrature A & B with Index

See http://www.encoder.com/literature/index-phasing.pdf for additional options and waveforms.

OUTPUT TYPE

5 - 28V In/Out[3]
- OC Open Collector
- PP Push-Pull
- HV Line Driver[4]
- PU Pull-Up Resistor[5]

8- 28V In/5V Out[6]
- H5 Line Driver[4]
- P5 Push-Pull

CONNECTOR TYPE[7]
- SMW 6-pin MS[4,8]
- SMY 7-pin MS[4]
- SMX 10-pin MS
- SMJ 5-pin M12 (12 mm)[4]
- SMK 8-pin M12 (12 mm)
- SMH 10-pin Bayonet[9]
- F00 Gland, 24" Cable[10]
- 9D 9-pin D-Sub[9]

OPERATING TEMPERATURE
- -20° to 85° C (Std)
- T1 -40° to 85° C
- T4 -20° to 105° C[11]

SEALING
- IP50 (Standard)
- S3 IP66

CERTIFICATION
- None (Std)
- CE CE Marked[12]

MODEL 25T/H CPR OPTIONS

0001	0002	0003	0005	0008	0010	0011	0012
0024	0025	0030	0032	0050	0060	0064	0070
0080	0100	0105	0115	0120	0125	0150	0180
0192	0200	0240	0250	0256	0300	0336	0360
0500	0512	0600	0625	1000	1024	1200	1250
1800	2000	2048	2500	3600	4096	5000	7200
8192	10,000						

Contact Customer Service for other disk resolutions.

NOTES:
1. Contact Customer Service for additional options.
2. Reverse Quadrature not available with PU output type.
3. 24 VDC max for T4 temperature option.
4. Line Driver not available with 5-pin M12 or 6-pin MS style connectors. Available with 7-pin MS style connector without index Z.
5. With Input Voltage above 16 VDC, operating temperature is limited to 85° C max.
6. Standard operating temperature only.
7. For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
8. Not available with CE option.
9. Not available with corrosion resistant option.
10. For non-standard English cable lengths, enter 'F' plus cable length expressed in feet. Example: F06 = 6 feet of cable.
11. Contact Customer Service for availability on resolutions < 360 CPR.
12. Please refer to Technical Bulletin *TB100: When to Choose the CE Mark* at encoder.com. Contact Customer Service for availability.

MODEL 25T/H SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 85° C
4.75 to 24 VDC max for temperatures between 85° and 105° C

Input Current ..... 100 mA max with no output load

Output Format..... Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the mounting face.
See *Waveform Diagram*, below.

Output Types..... Open Collector – 20 mA max per channel
Pull Up – Open Collector with 2.2K ohm internal resistor, 20 mA max per channel
Push-Pull – 20 mA max per channel
Line Driver – 20 mA max per channel (Meets RS 422 at 5 VDC supply)

Index..... Once per revolution.
1 to 360 CPR: Ungated
361 to 10,000 CPR: Gated to output A
See *Waveform Diagram*, below.

Max Frequency ..... 250 kHz for 1 to 2500 CPR
500 kHz for 2501 to 5000 CPR
1 MHz for 5001 to 10,000 CPR Electrical Protection Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.

CE Testing ..... Emissions tested per EN61000-6-3:2001 as applicable. Immunity tested per EN6100-6-2: 2005 as applicable.

Min. Edge Sep ..... 45° electrical min, 63° electrical or better typical

Rise Time..... Less than 1 microsecond

Accuracy..... Within 0.1° mechanical from one cycle to any other cycle, or 6 arc minutes.

Mechanical

Max Shaft Speed..... 6000 RPM, 8000 RPM intermittent
4000 RPM for IP66 seal option

Bore Tolerance ..... -0.0000"/+0.0008"

User Shaft Tolerances
Radial Runout ..... 0.005" max
Axial Endplay..... ±0.050" max

Starting Torque ..... IP50 sealing: 1.0 oz-in typical
IP66 sealing: 4.0 oz-in typical
Note: Add 1.0 oz-in typical for -20° C operation

Moment of Inertia ... 7.6×10^{-4} oz-in-sec^2

Housing ..... Proprietary nylon composite

Weight..... 8 oz typical

Environmental

Storage Temp.....-20° to 85° C

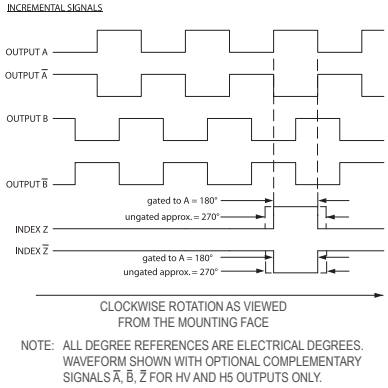
Humidity..... 98% RH non-condensing

Vibration..... 20 g @ 5 to 2000 Hz

Shock..... 80 g @ 11 ms duration

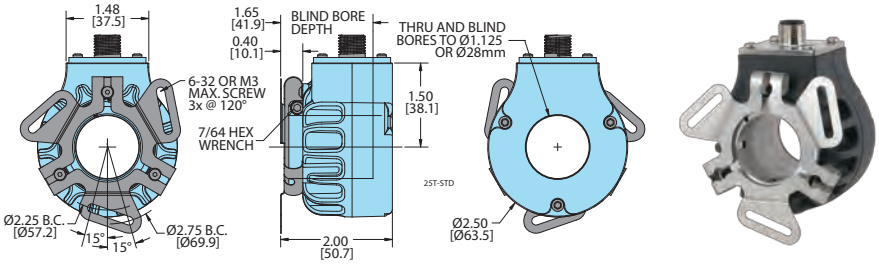
Sealing..... IP50, IP66 with shaft seals at both ends

WAVEFORM DIAGRAM

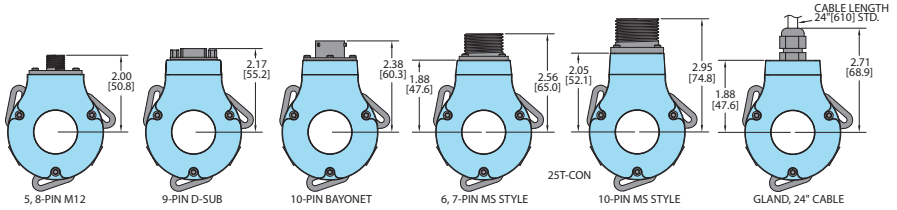


NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV AND H5 OUTPUTS ONLY.

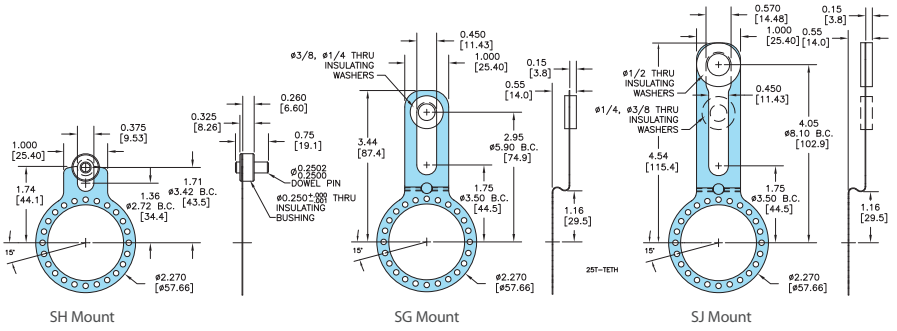
MODEL 25T/H 3-POINT FLEX MOUNT (SE)



MODEL 25T/H CONNECTOR OPTIONS



MODEL 25T/H MOUNTING OPTIONS



All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.

Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	5-pin M12**	8-pin M12**	10-pin MS	7-pin MS HV, H5	7-pin MS PU, PP, OC, P5	6-pin MS PU, PP, OC, P5	9-pin D-Sub	10-pin Bayonet HV, H5, OD, PU, PP, OC, P5
Com	Black	3	7	F	F	F	A, F	9	F
+VDC	White	1	2	D	D	D	B	1	D
A	Brown	4	1	A	A	A	D	2	A
A'	Yellow	--	3	H	C	--	--	3	H
B	Red	2	4	B	B	B	E	4	B
B'	Green	--	5	I	E	--	--	5	J
Z	Orange	5	6	C	--	C	C	6	C
Z'	Blue	--	8	J	--	--	--	7	K
Case	--	--	--	G	G	G	--	8	G
Shield	Bare*	--	--	--	--	--	--	--	--

*CE Option: Cable shield (bare wire) is connected to internal case.
†Standard cable is 24 AWG conductors with foil and braid shield.
**CE Option: Use cable cord set with shield connected to M12 connector coupling nut.

MODEL 58TP – PROGRAMMABLE

Ø58 mm

FEATURES

Programmable with USB Module or Factory Configured when Ordered
Programmable Resolution from 1 to 65,536 CPR
Programmable Output Type and Wave Form
58 mm Thru-Bore or Hollow Bore (Blind)
Standard and Metric Thru-Bore Sizes up to 5/8" and 15 mm
Several Flexible Mounting Options
Sealing Options up to IP67

The Model 58TP Programmable 58 mm Accu-CoderPro™ thru-bore encoder is specifically designed for the challenges of an industrial environment. Its advanced set of electronics allow the encoder to be programmed to meet your exact application needs. Using EPC's optional programming module, users may select the output type, 32 different waveforms, and any resolution from 1 to 65,536 CPR – that's 262,144 counts using 4x quadrature counting. These programming features allow a single encoder to be configured for multiple applications, enabling one encoder to replace many different part numbers – and that provides cost savings on inventory and down-time replacement. The 58TP can also be configured and shipped with specs pre-programmed, with no on-site programming needed.

COMMON APPLICATIONS

Motor Control, Conveyors, Elevator Controls, Machine Control, Food Processing, Process Control, Robotics, Material Handling, Textile Machines and all types of Motion Control Feedback

MODEL 58TP ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Mechanical | Electrical | Optional Features (Leave Blank for Standard Options)

58TP	–	02	SE	–	B	1000	B5	OC	–	S	–	MK	–			
														-20° to 85°C Std	IP50 Std	None Std

MODEL
58TP Thru-Bore
58HP Hollow Bore (Blind)

BORE SIZE

01	1/4", 0.250"	04	6 mm
03	5/16", 0.3125"	14	8 mm
02	3/8", 0.375"	10	10 mm
05	1/2", 0.500"	09	11 mm
11	5/8", 0.625"	12	12 mm
		13	14 mm
		15	15 mm

MOUNTING
SE 2.25" to 2.75" B.C. 3-point Flex Mount
SH 2.72" to 3.42" B.C. (Block & Pin) Tether Arm Kit
SG 3.50" to 5.90" B.C. (4.5" C-face) Tether Arm Kit
SJ 3.50" to 8.10" B.C. (8.5" C-face) Tether Arm Kit

CPR PROGRAMMING RANGE
A 1 to 16,384
B 1 to 65,536

CPR[1]
Programmable feature. Select the initial CPR to be programmed at factory.

WAVEFORM[1]
Programmable feature. Select the initial index and waveform configuration to be programmed at factory. See page 56 for options.

OUTPUT TYPE[1]
Programmable feature. Select the initial output type to be programmed at factory.

Programmable Outputs
OC Open Collector[2]
PP Push-Pull
HV Line Driver

Limited Programmable[3] 5-30 VDC in & 5 VDC out
H5 Line Driver
P5 Push-Pull

Non-Programmable Output
PU Pull-Up Resistor[2]

CONNECTOR TYPE

MY	7-pin MS[4]
MX	10-pin MS
MJ	5-pin M12 (12 mm)[5]
MK	8-pin M12 (12 mm)
F00	Gland, 24" Cable[6]
M00	Gland, 2M Cable[6]
9D	9-pin D-Sub
MR	12-pin M23

OPERATING TEMPERATURE
-20° to 85° C (Std)
T6 -40° to 100° C

SEALING
IP50 (Standard)
S1 IP64
S3 IP66
S4 IP67

CERTIFICATION
None (Std)
CE CE Marked[7]

NOTES:
1 Programmable feature using Field Programming Software, USB Programming Module, and Interface Cable. For more information, see *EPC Field Programming Software User Guide* at encoder.com.
2 Open Collector (OC) and Pull-Up Resistor (PU) outputs not recommended for CPR > 8192 and/or frequencies > 150 KHz.
3 If ordered with initial output type of either H5 or P5, encoder cannot be programmed to OC, PP, or HV output types.
4 7-pin MS Connector does not provide Index Pulse Z when selected output is Line Driver (HV or H5).
5 5-pin M12 Connectors only available with Pull-Up, Open Collector, and Push-Pull output types.
6 For non-standard English cable lengths enter 'F' plus cable length expressed in feet. Example: F06 = 6 feet of cable. For non-standard metric cable lengths enter 'M' plus cable length expressed in meters. Example: M06 = 6 meters of cable. Frequency above 300 kHz standard cable lengths only.
7 Please refer to Technical Bulletin *TB100: When to Choose the CE Mark* at encoder.com.

ACCU-CODERPRO™ by Encoder Products Company

MODEL 58TP SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 30 VDC max. See Output Types for limitations

Input Current..... 100 mA max with no output load (65 mA typical)

Output Format..... Incremental, Programmable. See Waveforms on following pages for options.

Output Types..... **Line Driver* (HV)** – 20 mA max per channel, max freq 1.0 MHz, 5 VDC max at 100° C or 24 VDC max at 85° C.
Line Driver* (H5) – 5-30 VDC in/5 VDC out, 20 mA max per channel, max freq 2.7 MHz, 5 VDC max at 100° C.
Push-Pull (PP) – 20 mA max per channel, max frequency 1.0 MHz, 5 VDC max at 100° C or 24 VDC max at 85° C.
Push-Pull (PS) – 5-30 VDC in/5 VDC out, 20 mA max per channel, max frequency 2.7 MHz, 5 VDC max at 100° C.
Open Collector (OC) – 100 mA max per channel, 200 KHz max freq recommended
Pull-Up (PU) – 2.2K ohm internal resistors, 100 mA max per channel, 150 KHz max freq recommended, max temp 85° C at > 24 VDC
**Meets RS 422 at 5 VDC supply*

Index ..... Once per revolution, programmable. EPC standard is 180° gated to output A (waveform B5). See *Waveform Diagrams* for additional options.

Index Teach..... Index location adjustable via programming interface.

Max Frequency ..... 2.7 MHz subject to RPM restrictions for high resolution (CPR):
5000 RPM max for CPR 16385 to 32768 and 2500 RPM max for CPR 32769 to 65536
NOTE: Use 5 VDC Line Driver (H5 or HV output type) to obtain high frequencies.

Electrical Protection .. Overvoltage, reverse voltage, and output short circuit protected. NOTE: Sustained over or reverse voltage may result in permanent damage.

CE/EMC ..... Immunity tested per EN 61000-6-2:2005
Emission tested per EN 61000-6-4:2007 + A1: 2011

Rise Time ..... Less than 1 microsecond

Accuracy..... Better than 0.015° or 54 arc-sec from true position

Diagnostic ..... LED located on encoder housing and error report available via programming Interface.

Mechanical

Max Shaft Speed..... 6000 RPM. Higher shaft speeds may be achievable, contact Customer Service.

Shaft Material ..... 303 Stainless Steel

Shaft Rotation ..... Bi-directional

Bore Tolerance ..... -0.0000"/+0.001"

User Shaft Tolerances
- Radial Runout..... 0.005" max
- Axial Endplay..... ±0.030 max

Starting Torque ..... IP50 sealing: 3.0 oz-in typical
IP64 sealing: 4.0 oz-in typical
IP66 or IP67 sealing: 7.0 oz-in typical

Moment of Inertia ... 5.5 x 10^{-4} oz-in-sec^2

Housing ..... Black non, corrosive finish

Weight..... 10 oz.

Environmental

Operating Temp ..... -20° to 85° C for standard models
-40° to 100° C for extended temp option
NOTE: For IP66 or IP67 sealing derate max temperature of 100° C by 4° C for every 1000 RPM above 2000 RPM.

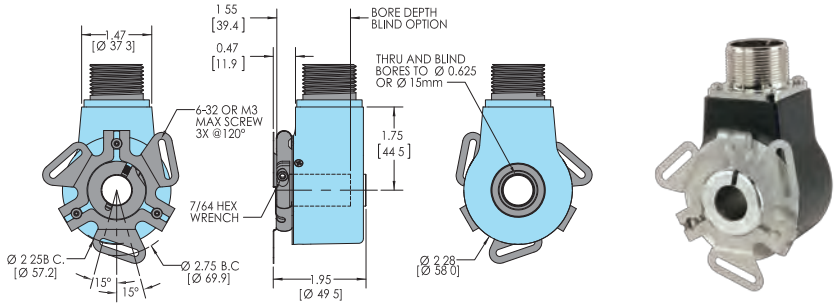
Humidity..... 95% RH non-condensing

Vibration..... 10 to 2000 Hz A 20g (International Standard IEC 60068-2-6)

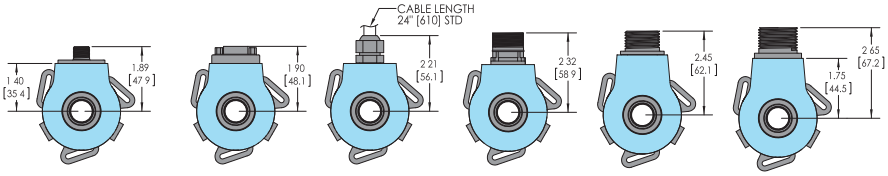
Shock..... 80g @ 6 ms Duration (International Standard IEC 60068-2-27)

Sealing..... IP50 standard; IP64, IP66 or IP67 optional

MODEL 58TP / 58HP 3-POINT FLEX MOUNT (SE)

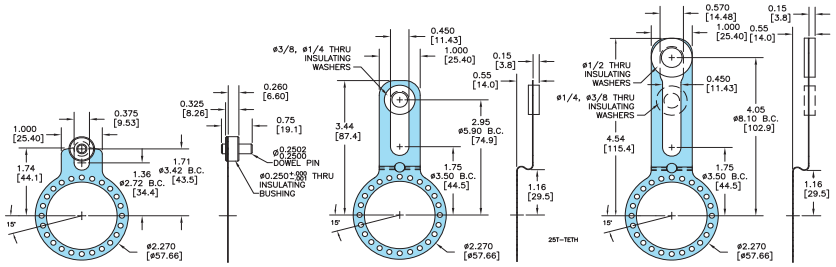


MODEL 58TP / 58HP CONNECTOR OPTIONS



5, 8-PIN M12 | 9-PIN D-SUB | GLAND CABLE | 12-PIN M23 | 7-PIN MS STYLE | 10-PIN MS

MODEL 58TP / 58HP MOUNTING OPTIONS



SH Mount
SH Mount

SG Mount
SG Mount

SJ Mount
SJ Mount

All dimensions are in inches with a tolerance of +0.005" or +0.01" unless otherwise specified.
Metric dimensions are given in brackets [mm].

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.
Trim back and insulate unused wires.

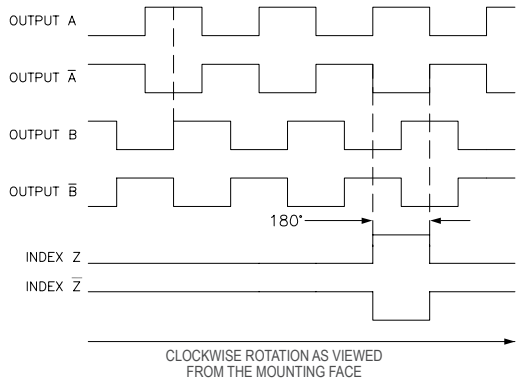
Function	Gland Cable† Wire Color	5-pin M12**	8-pin M12**	10-pin MS	7-pin MS HV,H5	7-pin MS PU,PP,OC,P5	9-pin D-sub	12-pin M23
Com	Black	3	7	F	F	F	9	10
+VDC	Red	1	2	D	D	D	1	12
A	White	4	1	A	A	A	2	5
A'	Brown	--	3	H	C	--	3	6
B	Blue	2	4	B	B	B	4	8
B'	Violet	--	5	I	E	--	5	1
Z	Orange	5	6	C	--	C	6	3
Z'	Yellow	--	8	J	--	--	7	4
Case	Green	--	--	G	G	G	8	9
Shield	Bare*	--	--	--	--	--	--	--
+VDC Sense	--	--	--	--	--	--	--	2
Com Sense	--	--	--	--	--	--	--	11

*CE Option: Cable shield (bare wire) is connected to internal case.
†Standard cable is 24 AWG conductors with foil and braid shield.
**CE Option: Use cable cordset with shield connected to M12 connector coupling nut.

MODEL 58TP – PROGRAMMABLE

EPC STANDARD WAVEFORM (B5)

Additional waveforms available. See below for other options.

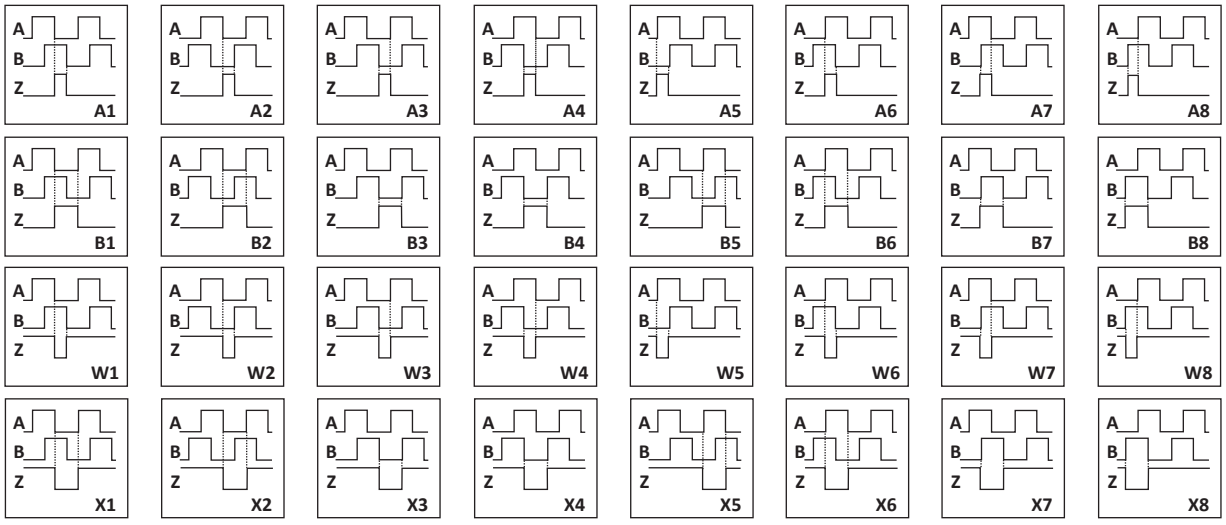


NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES.
COMPLEMENTARY SIGNALS Ā, B̄, Z̄ APPLY TO LINE DRIVER (HV & H5) OUTPUTS ONLY.

An EPC Thru-Bore Encoder in a common application, mounted on a motor with an SJ Flex Mount

WAVEFORMS

Choose any of these waveforms using the Field Programming Software, USB programming module, and interface cable (see page 57).



Odd numbers - A leads B
Even numbers - B leads A

A and B - High Going Index
W and X - Low Going Index

A and W - 90 Degree Index
B and X - 180 Degree Index

FIELD PROGRAMMING SOFTWARE

With the easy to use, point-and-click interface, programming is quick and straight-forward. The number of possible configurations makes this Size 58 programmable thru-bore or hollow bore encoder incredibly versatile. Anywhere a Size 58 thru-bore or hollow bore encoder goes, the Model 58TP can get the job done.

Available on USB drive or by download.

System requirements:

- Windows 7 or higher operating systems
- USB 2.0 port required for USB Programming Module (see below)

✓ CPR – any resolution from 1 to 65,536

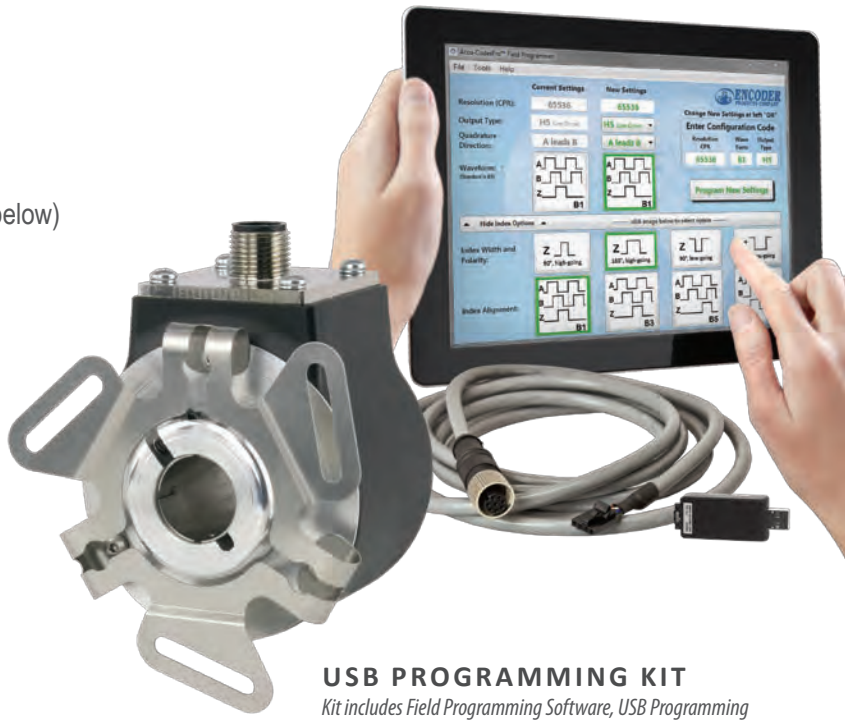
That's 262,144 counts using 4x quadrature counting

✓ Waveform – choose from 32 options

See page 56 for waveform choices

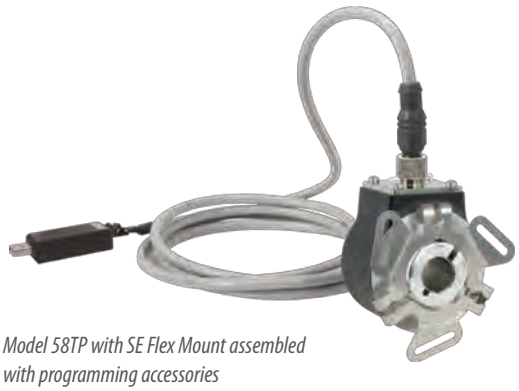
✓ Output type – 6 different output types

All output types are 5V to 30V in/out except H5 Line Driver and P5 Push-Pull output types, which are 5-30VDC in and 5VDC out.



USB PROGRAMMING KIT

Kit includes Field Programming Software, USB Programming Module, and 2-meter Interface Cable with specified connector. See Accessories for individual Interface Cables.



Model 58TP with SE Flex Mount assembled with programming accessories

Interface Cable
USB Programming Module (black)
USB drive for Field Programming Software (blue)

CONNECTOR TYPE	ITEM #
7-pin MS	PR1-001-07
10-pin MS	PR1-001-10
5-pin M12	PR1-001-J
8-pin M12	PR1-001-K
9-pin D-Sub	PR1-001-09
Gland Cable	PR1-001-G
12-pin M23	PR1-001-R

MODEL 58TF

Ø58 mm

FEATURES

58 mm Thru-Bore or Hollow Bore (Blind)
Standard and Metric Thru-Bore Sizes up to 5/8" and 15 mm
Resolution from 1 to 65,536 CPR
Several Flexible Mounting Options
Sealing Options up to IP67
Multiple Connector Options

The Model 58TF Accu-CoderPro™ is a 58 mm thru-bore encoder that is specifically designed for the challenges of an industrial environment. Its advanced set of electronics allow the encoder to be configured to meet your exact application needs. Choose from 6 output types, 32 different waveforms, and select any resolution from 1 to 65,536 CPR (that's 262,144 counts in full quadrature). The Model 58TF is also highly mechanically configurable, with bore options up to 5/8" or 15 mm, several flexible mounting options, multiple connector options, and sealing up to IP67. This versatile thru-bore encoder can go in almost any application.

COMMON APPLICATIONS

Motor Control, Conveyors, Elevator Controls, Machine Control, Food Processing, Process Control, Robotics, Material Handling, Textile Machines and all types of Motion Control Feedback

MODEL 58TF ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Mechanical | Electrical | Optional Features (Leave Blank for Standard Options)

58TF – 02 SE – X 1000 B5 OC – S – MK – [ ] [ ] [ ]

(-20° to 85°C Std | IP50 Std | None Std)

MODEL
58TF Thru-Bore
58HF Hollow Bore (Blind)

BORE SIZE

01	1/4", 0.250"	04	6 mm
03	5/16", 0.3125"	14	8 mm
02	3/8", 0.375"	10	10 mm
05	1/2", 0.500"	09	11 mm
11	5/8", 0.625"	12	12 mm
		13	14 mm
		15	15 mm

MOUNTING
SE 2.25" to 2.75" B.C. 3-point Flex Mount
SH 2.72" to 3.42" B.C. (Block & Pin) Tether Arm Kit
SG 3.50" to 5.90" B.C. (4.5" C-face) Tether Arm Kit
SJ 3.50" to 8.10" B.C. (8.5" C-face) Tether Arm Kit

CPR
1 - 65,536
Price Adder for > 16,384

WAVEFORM
Select the index and waveform configuration. See page 56 for options.

OUTPUT TYPE [1]
OC Open Collector[2]
PP Push-Pull
HV Line Driver
PU Pull-Up Resistor[2]
H5 Line Driver
P5 Push-Pull

CONNECTOR TYPE
MY 7-pin MS[3]
MX 10-pin MS
MJ 5-pin M12 (12 mm)[4]
MK 8-pin M12 (12 mm)
F00 Gland, 24" Cable[5]
M00 Gland, 2M Cable[5]
9D 9-pin D-Sub
MR 12-pin M23

OPERATING TEMPERATURE
-20° to 85° C (Std)
T6 -40° to 100° C

SEALING
IP50 (Standard)
S1 IP64
S3 IP66
S4 IP67

CERTIFICATION
None (Std)
CE CE Marked[6]

NOTES:
1 All output types are 5V to 30V in/out *except* H5 Line Driver and P5 Push-Pull output types, which are 5-30VDC in and 5VDC out.
2 Open Collector (OC) and Pull-Up Resistor (PU) outputs not recommended for CPR > 8192 and/or frequencies > 150 KHz.
3 7-pin MS Connector does not provide Index Pulse Z when selected output is Line Driver (HV or H5).
4 5-pin M12 Connectors only available with Pull-Up, Open Collector, and Push-Pull output types.
5 For non-standard English cable lengths enter 'F' plus cable length expressed in feet. Example: F06 = 6 feet of cable. For non-standard metric cable lengths enter 'M' plus cable length expressed in meters. Example: M06 = 6 meters of cable. Frequency above 300 kHz standard cable lengths only.
6 Please refer to Technical Bulletin *TB100: When to Choose the CE Mark* at encoder.com.

ACCU-CODERPRO™ by Encoder Products Company

MODEL 58TF SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 30 VDC max. See Output Types for limitations

Input Current..... 100 mA max with no output load (65 mA typical)

Output Format..... Incremental, Programmable. See Waveforms on page 56 for options.

Output Types..... **Line Driver* (HV)** – 20 mA max per channel, max freq 1.0 MHz, 5 VDC max at 100° C or 24 VDC max at 85° C.
Line Driver* (H5) – 5-30 VDC in/5 VDC out, 20 mA max per channel, max freq 2.7 MHz, 5 VDC max at 100° C.
Push-Pull (PP) – 20 mA max per channel, max frequency 1.0 MHz, 5 VDC max at 100° C or 24 VDC max at 85° C.
Push-Pull (P5) – 5-30 VDC in/5 VDC out, 20 mA max per channel, max frequency 2.7 MHz, 5 VDC max at 100° C.
Open Collector (OC) – 100 mA max per channel, 200 KHz max freq recommended
Pull-Up (PU) – 2.2K ohm internal resistors, 100 mA max per channel, 150 KHz max freq recommended, max temp 85° C at > 24 VDC
**Meets RS 422 at 5 VDC supply*

Index ..... Once per revolution, programmable. EPC standard is 180° gated to output A (waveform B5). See *Waveform Diagrams* for additional options.

Max Frequency ..... 2.7 MHz subject to RPM restrictions for high resolution (CPR):
5000 RPM max for CPR 16385 to 32768 and 2500 RPM max for CPR 32769 to 65536
NOTE: Use 5 VDC Line Driver (H5 or HV output type) to obtain high frequencies.

Electrical Protection .. Overvoltage, reverse voltage, and output short circuit protected. NOTE: Sustained over or reverse voltage may result in permanent damage.

CE/EMC ..... Immunity tested per EN 61000-6-2:2005
Emission tested per EN 61000-6-4:2007 + A1: 2011

Rise Time ..... Less than 1 microsecond

Accuracy..... Better than 0.015° or 54 arc-sec from true position

Mechanical

Max Shaft Speed..... 6000 RPM. Higher shaft speeds may be achievable, contact Customer Service.

Shaft Material ..... 303 Stainless Steel

Shaft Rotation ..... Bi-directional

Bore Tolerance ..... -0.0000"/+0.001"

User Shaft Tolerances
- Radial Runout..... 0.005" max
- Axial Endplay..... ±0.030 max

Starting Torque ..... IP50 sealing: 3.0 oz-in typical
IP64 sealing: 4.0 oz-in typical
IP66 or IP67 sealing: 7.0 oz-in typical

Moment of Inertia ... 5.5×10^{-4} oz-in-sec^2

Housing ..... Black non, corrosive finish

Weight..... 10 oz.

Environmental

Operating Temp ..... -20° to 85° C for standard models
-40° to 100° C for extended temp option

NOTE: For IP66 or IP67 sealing derate max temperature of 100° C by 4° C for every 1000 RPM above 2000 RPM.

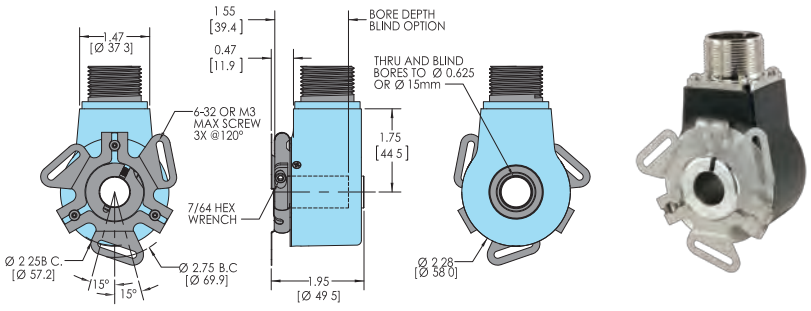
Humidity..... 95% RH non-condensing

Vibration..... 10 to 2000 Hz A 20g (International Standard IEC 60068-2-6)

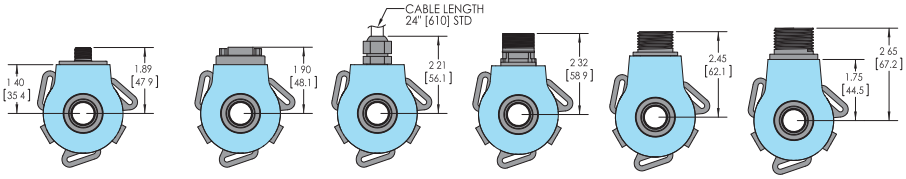
Shock..... 80g @ 6 ms Duration (International Standard IEC 60068-2-27)

Sealing..... IP50 standard; IP64, IP66 or IP67 optional

MODEL 58TF / 58HF 3-POINT FLEX MOUNT (SE)

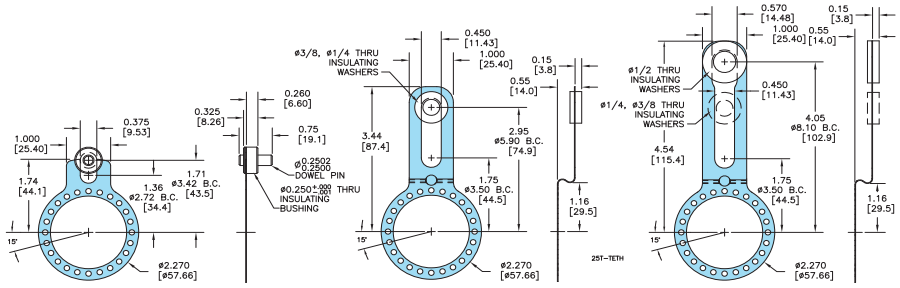


MODEL 58TF / 58HF CONNECTOR OPTIONS



5, 8-PIN M12 | 9-PIN D-SUB | GLAND CABLE | 12-PIN M23 | 7-PIN MS STYLE | 10-PIN MS

MODEL 58TF / 58HF MOUNTING OPTIONS



SH Mount | SG Mount | SJ Mount

All dimensions are in inches with a tolerance of +0.005" or +0.01" unless otherwise specified.
Metric dimensions are given in brackets [mm].

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.
Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	5-pin M12**	8-pin M12**	10-pin MS	7-pin MS HV,H5	7-pin MS PU,PP,OC,P5	9-pin D-sub	12-pin M23
Com	Black	3	7	F	F	F	9	10
+VDC	Red	1	2	D	D	D	1	12
A	White	4	1	A	A	A	2	5
A'	Brown	--	3	H	C	--	3	6
B	Blue	2	4	B	B	B	4	8
B'	Violet	--	5	I	E	--	5	1
Z	Orange	5	6	C	--	C	6	3
Z'	Yellow	--	8	J	--	--	7	4
Case	Green	--	--	G	G	G	8	9
Shield	Bare*	--	--	--	--	--	--	--
+VDC Sense	--	--	--	--	--	--	--	2
Com Sense	--	--	--	--	--	--	--	11

*CE Option: Cable shield (bare wire) is connected to internal case.
†Standard cable is 24 AWG conductors with foil and braid shield.
**CE Option: Use cable cordset with shield connected to M12 connector coupling nut.

MODEL 775

FEATURES
Thru-Bore Design for Easy Mounting
Bore Options to 1.375"
Incorporates Opto-ASIC Technology
Resolutions to 4096 CPR
100° C Operating Temperature Available
CE Marking Available

The sleek design of the Model 775 Thru-Bore Series Accu-Coder™ makes form and function a successful reality. The slim profile and Thru-Bore design, makes installation easy by simply slipping the bore over motor shafts up to 1.375" in diameter. The advanced Opto-ASIC based electronics provide the superior noise immunity necessary in many industrial applications. With a variety of bore sizes, resolutions, and connector types, application possibilities are endless.

COMMON APPLICATIONS
Motor Feedback, Velocity & Position Control, Food Processing, Robotics, Material Handling

MODEL 775 ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

775 – A – H – 1024 – Q – OC – C – Y – N – N – CE

MODEL
775 Slim Thru-Bore

HOUSING STYLE
A Completely encloses motor shaft, and eliminates access to motor shaft. For physical protection only.
B Thru-Bore housing version. Allows access to motor shaft.

OPERATING TEMPERATURE
S 0° to 70° C
H 0° to 100° C

CYCLES PER REVOLUTION
1 - 4096
See *CPR Options* below for available resolutions.
Price adder for CPR >1024

NUMBER OF CHANNELS[1]
Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index
Channel B Leads A
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index
See http://www.encoder.com/literature/index-phasing.pdf for additional options, and waveforms.

OUTPUT TYPE
5 - 28V In/Out[2]
OC Open Collector
PU Pull-Up Resistor
PP Push-Pull
HV Line Driver[3]

CONNECTOR TYPE[4]
P Gland Nut with 24" Cable[5]
W 6-pin MS[6]
Y 7-pin MS[3,6]
X 10-pin MS[6]
J 5-pin M12 (12 mm)[3,6]
K 8-pin M12 (12 mm)[6]
9D 9-pin D-subminiature

BORE SIZE

A	5/8", 0.625" collet style	H	14 mm collet style
B	3/4", 0.750" collet style	I	19 mm collet style
C	7/8", 0.875" collet style	K	24 mm collet style
D	1", 1.000" collet style	M	25 mm clamp style
O	1-1/8", 1.125" clamp style	L	28 mm clamp style
T	1-1/4", 1.250" clamp style	Q	30 mm clamp style
V	1-3/8", 1.375" clamp style	R	32 mm clamp style

ANTI-ROTATION FLEX MOUNT
N None
A Style A

MATING CONNECTOR
N No Connector
Y Yes

CERTIFICATION
N None
CE CE Marked[7]

MODEL 775 CPR OPTIONS

0060	0100	0120	0240	0250	0256	0500
0512	1000	1024	2048	2500	4096	

Contact Customer Service for other disk resolutions; not all disk resolutions available with all output types

NOTES:
1 Contact Customer Service for index gating options.
2 5 to 24 VDC max for high temperature option.
3 Line Driver Outputs not available with 5-pin M12 or 6-pin MS connector. Available with 7-pin MS connector only without Index Z.
4 For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
5 For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: P/6 = 6 feet of cable.
6 Connector options other than 9D and P require extended housing. See drawing, next page.
7 Please refer to Technical Bulletin *TB100: When to Choose the CE Mark* at encoder.com.

MODEL 775 SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 70° C
4.75 to 24 VDC for temperatures between 70° C and 100° C

Input Current ..... 100 mA max with no output load

Input Ripple..... 100 mV peak-to-peak at 0 to 100 kHz

Output Format..... Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the mounting face.
See *Waveform Diagrams*.

Output Types..... Open Collector – 100 mA max per channel
Pull-Up – Open Collector with 2.2K ohm internal resistor, 100 mA max per channel
Push-Pull – 20 mA max per channel
Line Driver – 20 mA max per channel (Meets RS 422 at 5 VDC supply)

Index..... Once per revolution.
0001 to 0474 CPR: Ungated
0475 to 4096 CPR: Gated to output A
See *Waveform Diagrams*.

Max Frequency ..... 200 kHz

Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.

Noise Immunity..... Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN50081-2

Quadrature..... 67.5° electrical or better is typical,
Edge Separation 54° electrical minimum at temperatures > 99° C

Rise Time..... Less than 1 microsecond

Mechanical

Max Shaft Speed..... 6000 RPM. Higher shaft speeds may be achievable, contact Customer Service.

User Shaft Tolerances
Radial Runout ..... 0.005"
Axial Endplay..... ±0.030" with appropriate flex mount

Moment of Inertia ... 3.3 X 10^{-3} oz-in-sec^2 typical

Housing ..... All metal construction

Weight..... 1.0 lb with gland nut or D-sub connector option 1.5 lb with MS connector option
Note: All weights typical

Environmental

Storage Temp ..... -25° to 100° C

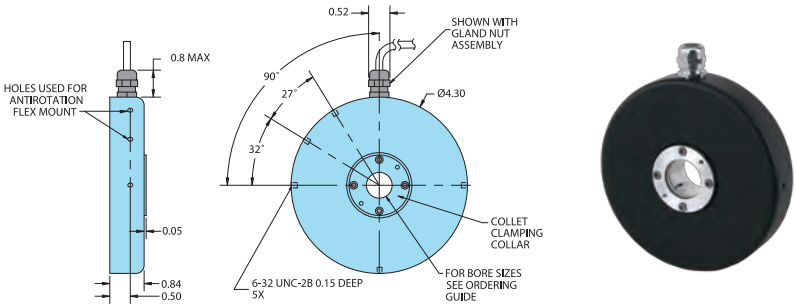
Humidity..... 98% RH non-condensing

Vibration..... 10 g @ 58 to 500 Hz

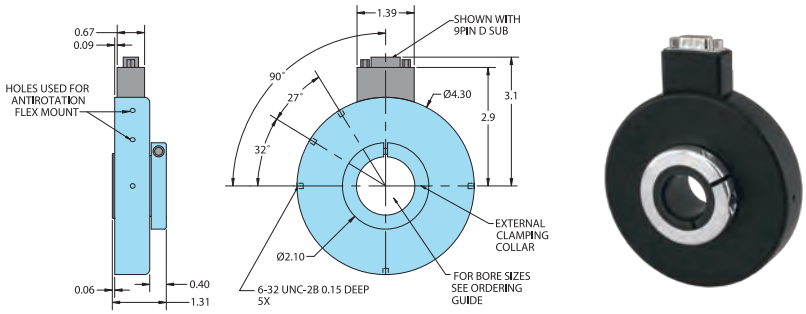
Shock..... 50 g @ 11 ms duration

Sealing..... IP50

MODEL 775 COLLET CLAMP (A, B, C, D, H, I, K)

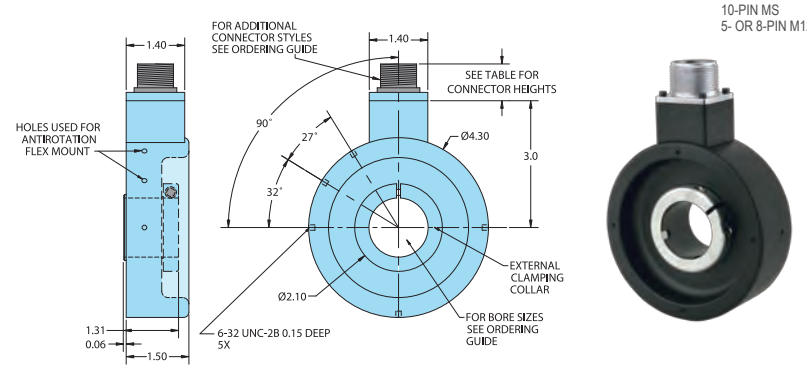


MODEL 775 CLAMP STYLE (O, T, V, M, L, Q)

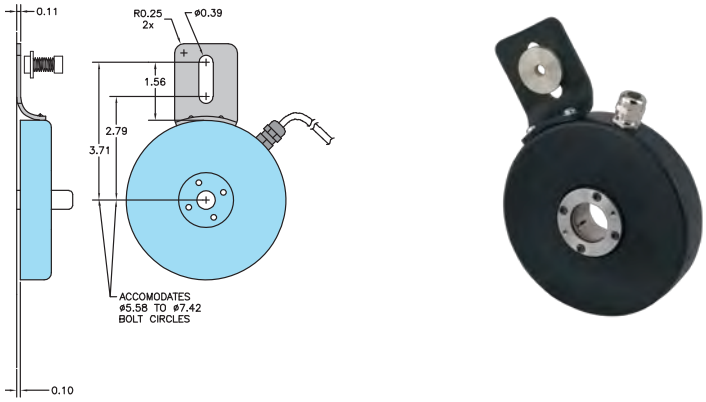


MODEL 775 EXTENDED HOUSING (W, X, Y, J, K)

CONNECTOR TYPE	HEIGHT
6- OR 7-PIN MS	0.67"
10-PIN MS	0.90"
5- OR 8-PIN M12	0.50"



MODEL 775 SHOWN WITH ANTI-ROTATION FLEX MOUNT



All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

For wiring table and waveforms, see page 64.

MODEL 776

FEATURES
Slim Profile – Only 1.36" In Depth
Thru-Bore Design For Easy Mounting
Incorporates Opto-ASIC Technology
Resolutions to 4096
Bore Options to 1.875"
CE Marking Available

The Thru-Bore Series Accu-Coder™ Model 776 encoder is designed to fit directly on either a motor or other shaft where position, direction, or velocity information is needed. The advanced Opto-ASIC based electronics provide the superior noise immunity necessary in many industrial applications. The Model 776 conveniently features a clamp type mount for fast and easy mounting over a large range of shaft sizes. An optional anti-rotation flex mount maintains housing stability.

COMMON APPLICATIONS
Motor Feedback, Velocity & Position Control, Robotics, Conveyors, Material Handling

MODEL 776 ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

776 – A – H – 1024 – Q – OC – C – Y – N – N – CE

MODEL
776 Slim Thru-Bore

OPERATING TEMPERATURE
S 0° to 70° C
H 0° to 100° C

HOUSING STYLE
A Completely encloses motor shaft, and eliminates access to motor shaft. For physical protection only.
B Thru-Bore housing version. Allows access to motor shaft.

CYCLES PER REVOLUTION
1 - 4096
See *CPR Options* below for available resolutions.
Price adder for CPR >1024

NUMBER OF CHANNELS[1]
Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index
Channel B Leads A
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index
See http://www.encoder.com/literature/index-phasing.pdf for additional options and waveforms.

OUTPUT TYPE
5 - 28V In/Out[2]
OC Open Collector
PU Pull-Up Resistor
PP Push-Pull
HV Line Driver[3]

BORE SIZE
G 1-7/16", 1.4375"
C 1-1/2", 1.500"
D 1-5/8", 1.625"
F 1-3/4", 1.750"
E 1-7/8", 1.875"
L 35 mm
I 38 mm
J 40 mm
M 42 mm
N 43 mm

CONNECTOR TYPE[4]
P Gland Nut with 24" Cable[5]
W 6-pin MS[3,6]
Y 7-pin MS[3,6]
X 10-pin MS[6]
J 5-pin M12 (12 mm)[3,6]
K 8-pin M12 (12 mm)[6]
9D 9-pin D-subminiature

ANTI-ROTATION FLEX MOUNT
N None
A Style A

MATING CONNECTOR
N No Connector
Y Yes

CERTIFICATION
N None
CE CE Marked[7]

MODEL 776 CPR OPTIONS

0060	0100	0120	0240	0250	0256	0500
0512	1000	1024	2048	2500	4096	

Contact Customer Service for other disk resolutions; not all disk resolutions available with all output types

NOTES:
1 Contact Customer Service for index gating options.
2 5 to 24 VDC max for high temperature option.
3 Line Driver not available with 5-pin M12 or 6-pin MS connector. Available with 7-pin MS connector only without Index Z.
4 For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
5 For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: P/6 = 6 feet of cable.
6 Connector options other than 9D and P require extended housing. See drawing, next page.
7 Please refer to Technical Bulletin *TB100: When to Choose the CE Mark* at encoder.com.

MODEL 776 SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 70° C
4.75 to 24 VDC for temperatures between 70° C and 100° C

Input Current ..... 100 mA max with no output load

Input Ripple..... 100 mV peak-to-peak at 0 to100 kHz

Output Format..... Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the mounting face.
See *Waveform Diagrams*.

Output Types..... Open Collector – 100 mA max per channel
Pull-Up – Open Collector with 2.2K ohm internal resistor, 100 mA max per channel
Push-Pull – 20 mA max per channel
Line Driver – 20 mA max per channel (Meets RS 422 at 5 VDC supply)

Index..... Once per revolution.
0475 to 4096 CPR: Gated to output A
0001 to 0474 CPR: Ungated
See *Waveform Diagrams*.

Max Frequency ..... 200 kHz

Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.

Noise Immunity..... Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN50081-2

Quadrature..... 67.5° electrical or better is typical,
Edge Separation 54° electrical minimum at temperatures > 99° C

Rise Time..... Less than 1 microsecond

Mechanical

Max Shaft Speed..... 3500 RPM. Higher shaft speeds may be achievable, contact Customer Service.

User Shaft Tolerances
Radial Runout ..... 0.005"
Axial Endplay..... ±0.030" with appropriate flex mount

Moment of Inertia ... 3.3 x 10^{-3} oz-in-sec^2 typical

Housing ..... All metal construction

Weight..... 1.0 lb with gland nut or D-sub connector option 1.5 lb with MS connector option
Note: All weights typical

Environmental

Storage Temp ..... -25° to 100° C

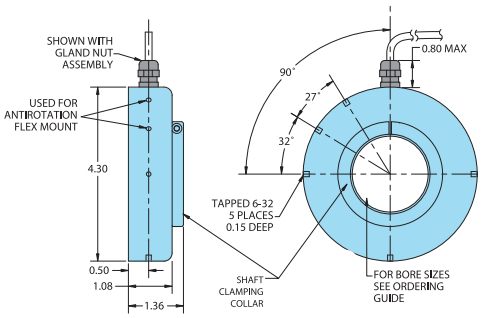
Humidity..... 98% RH non-condensing

Vibration..... 10 g @ 58 to 500 Hz

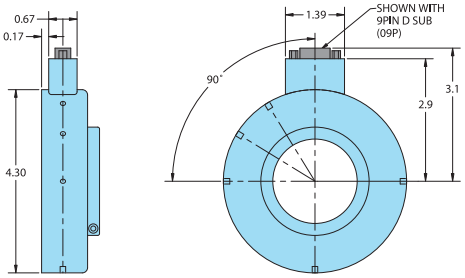
Shock..... 50 g @ 11 ms duration

Sealing..... IP50

MODEL 776 WITH GLAND NUT CABLE (P)

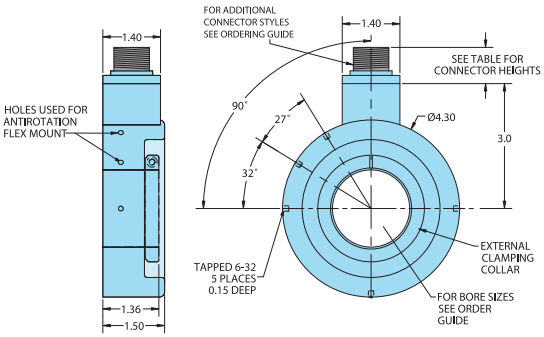


MODEL 776 WITH 9-PIN D-SUB CONNECTOR (9D)

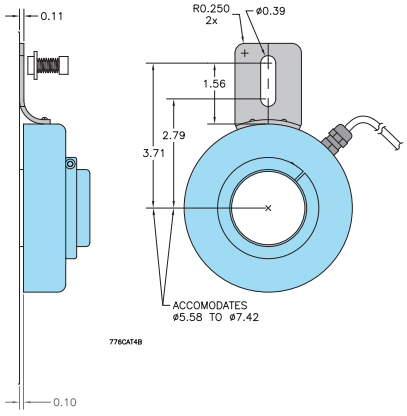


MODEL 776 EXTENDED HOUSING (W, X, Y, J, K)

CONNECTOR TYPE	HEIGHT
6- OR 7-PIN MS	0.67"
10-PIN MS	0.90"
5- OR 8-PIN M12	0.50"



MODEL 776 SHOWN WITH ANTI-ROTATION FLEX MOUNT



All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

For wiring table and waveforms, see page 64.

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.

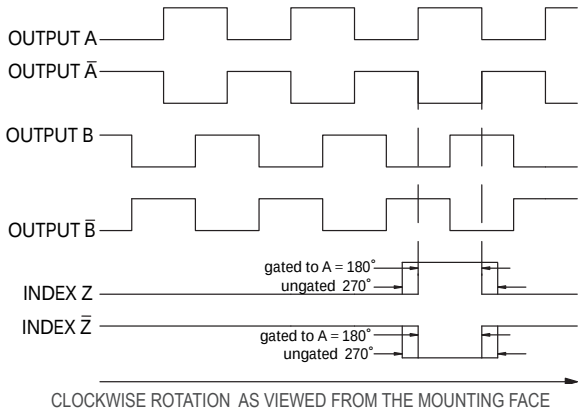
Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	5-pin M12++ PU, PP, OC	8-pin M12++	10-pin MS	7-pin MS HV	7-pin MS PU, PP, OC	6-pin MS PU, PP, OC	9-pin D-sub
Com	Black	3	7	F	F	F	A, F	9
+VDC	Red	1	2	D	D	D	B	1
A	White	4	1	A	A	A	D	2
A'	Brown	--	3	H	C	--	--	3
B	Blue	2	4	B	B	B	E	4
B'	Violet	--	5	I	E	--	--	5
Z	Orange	5	6	C	--	C	C	6
Z'	Yellow	--	8	J	--	--	--	7
Case	--	--	--	G**	G**	G**	--	8+
Shield	Bare*	--	--	--	--	--	--	--

*CE Option: Cable shield (bare wire) is connected to internal Case.
**CE Option: Pin G is connected to Case. Non-CE Option: Pin G has No Connection.
+CE Option: Pin G is connected to Case. Non CE Option: Pin 8 has No Connection.
++CE Option: Use cable cordset with shield connected to M12 connector coupling nut.
†Standard cable is 24 AWG conductors with foil and braid shield.

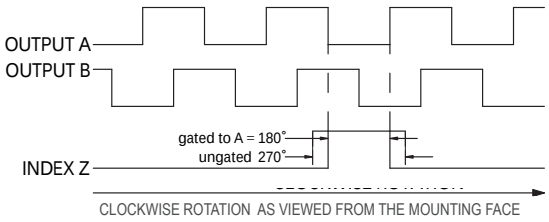
WAVEFORM DIAGRAMS

Line Driver and Push-Pull



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES.
WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS
Ā, B̄, Z̄ FOR HV OUTPUT ONLY.

Open Collector and Pull-Up



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES
INDEX IS POSITIVE GOING

BORE OPTIONS

When to Specify a Hollow Bore (Blind) Encoder vs. a Thru-Bore Encoder

ABOVE: Model 25T, a 2.5 inch thru-bore incremental encoder. Also available in hollow bore (blind). See below.
BELOW: A Model 25H hollow bore mounted on a conveyor belt system. See page 52 for product specifications.

When specifying a rotary encoder, should you opt for a hollow bore (also called a "blind encoder") or a thru-bore housing? Often either design can work equally well. However, in some situations there are important reasons to choose one over the other.

Generally, thru-bore (or through-bore) housings have a bore opening that passes completely through the encoder body. The encoder is more or less a donut. With a hollow bore (or blind bore) housing the bore does not pass completely through the encoder, with the shaft end residing inside the housing. The depth of the bore varies from model to model, with some units only having a cap or cover on one side of the housing.

NOTE: EPC offers many incremental encoders in both thru-bore and hollow bore (blind) ***configurations. Due to their electronics, magnetic absolute encoders are only offered as*** *hollow bore (blind). See Absolute Section, pages 10 - 25, for Absolute Encoder options.*

A thru-bore housing offers more flexibility for shaft attachment. Provided a means of securing the anti-rotation tether is readily available, a thru-bore encoder can be affixed to any point on the shaft in question.

Here are three factors that favor use of a hollow bore (blind) encoder:

ABOVE: Model 15H, a 1.5 inch hollow bore, or blind, incremental encoder. Also available in thru-bore. See below.
BELOW: A Model 15T mounted on the end of a motor. See page 40 for product specifications.

1. Environmental Seal. If your encoder will be exposed to dirt, dust and moisture, consider a hollow bore encoder. A thru-bore encoder has two exposed shaft seals that offer potential paths of contaminant ingress. With a hollow bore solution, one seal is protected from contaminants and potential leakage. If the encoder is exposed to washdown or direct water spray, we recommend a hollow bore housing if possible.

2. Starting Torque. Since a sealed thru-bore encoder has two shaft seals, the friction created by the additional shaft-seal interface is usually greater than that of a hollow bore housing, which can translate into greater starting torque for thru-bore versus hollow bore encoders.

3. Safety. With a hollow bore encoder, hazards presented by an exposed rotating shaft are minimized.

For most applications the items above may be relatively minor points to consider when specifying a rotary encoder. However, failure to properly address them could contribute to less than optimum encoder longevity and performance, especially when an application pushes encoder performance requirements toward the limits.

If you have questions about which housing is right for your application, our Technical Services Department is available to help you find the right solution. Call today.

MODEL 770

Ø6.5"

FEATURES

Slim Profile – Only 1.00" Deep
Fits NEMA Size 56C Thru 184C Motor Faces (4.5" AK)
Incorporates Opto-ASIC Technology
Resolutions to 4096 CPR

The Model 770 C-Face encoder is a rugged, high resolution encoder designed to mount directly on NEMA C-Face motors. Both sides of the encoder are C-Face mounts, allowing additional C-Face devices to be mounted to this encoder. Unlike many C-Face kit type encoders, the Model 770 contains precision bearings and an internal flex mount, virtually eliminating encoder failures and inaccuracies induced by motor shaft runout or axial endplay. The advanced Opto-ASIC design provides the advanced noise immunity necessary for many industrial applications. This encoder is ideal for applications using induction motors and flux vector control. The Model 770 provides speed and position information for drive feedback in a slim profile – only 1.00" thick. The Thru-Bore design allows fast and simple mounting of the encoder directly to the accessory shaft or to the drive shaft of the motor, using the standard motor face (NEMA sizes 56C - 184C). The tough, all-metal housing resists the vibration and hazards of an industrial environment.

COMMON APPLICATIONS

Motor Feedback, Velocity & Position Control, Conveyors, Variable Speed Drives, Mixing & Blending Motors, Assembly & Specialty Machines

MODEL 770 ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

770 – A – H – 1024 – Q – OC – A – Y – N – N – CE

MODEL
770 4.5" NEMA "AK" Dimension

OPERATING TEMPERATURE
S 0° to 70° C
H 0° to 100° C

CYCLES PER REVOLUTION
1 - 4096
See *CPR Options* below for available resolutions.
Price adder for CPR >1024

OUTPUT TYPE
5 - 28V In/Out[3]
OC Open Collector
PU Pull-Up Resistor
PP Push-Pull
HV Line Driver[4]

C-FACE GASKET KIT OPTION[1]
"B" HOUSING ONLY
N No
Y Yes

MATING CONNECTOR
N No Connector
Y Yes

CERTIFICATION
N None
CE CE Marked[7]

HOUSING STYLE
A Cover completely encloses motor shaft and eliminates access to motor shaft; IP65 rated. Includes C-face Gasket Kit.
B Thru-Bore housing version with IP50 dust seal[1]

NUMBER OF CHANNELS[2]
Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index
Channel B Leads A
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index
See http://www.encoder.com/literature/index-phasing.pdf for additional options, and waveforms.

BORE SIZE
A 5/8", 0.625"
B 3/4", 0.750"
C 7/8", 0.875"
D 1", 1.000"
H 14 mm
I 19 mm
K 24 mm

CONNECTOR TYPE[5]
P 24" Cable with Gland Nut[6]
B Terminal Strip in Conduit Box
X 10-pin MS on Conduit Box
Y 7-pin MS on Conduit Box[4]
J 5-pin M12 on Conduit Box[4]
K 8-pin M12 on Conduit Box
L 10-pin Industrial Clamp

MODEL 770 CPR OPTIONS

0060	0100	0120	0240	0250	0256	0500
0512	1000	1024	2048	2500	4096	

Contact Customer Service for other disk resolutions; not all disk resolutions available with all output types.

NOTES:
1 Thru-bore version may be IP65 sealed if mounted between two C-Face devices with optional gasket kit. Select 'Yes' under C-Face Gasket Kit Option.
2 Contact Customer Service for index gating options.
3 5 to 24 VDC max for high temperature option.
4 Line Driver Outputs not available with 5-pin M12 connector. Available with 7-pin MS connector only without Index Z.
5 For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
6 For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: P/6 = 6 feet of cable.
7 Please refer to Technical Bulletin *TB100: When to Choose the CE Mark* at encoder.com..

MODEL 770 SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 70° C
4.75 to 24 VDC for temperatures between 70° C and 100° C

Input Current ..... 100 mA max with no output load

Input Ripple..... 100 mV peak-to-peak at 0 to 100 kHz

Output Format..... Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the mounting face.
See *Waveform Diagrams*.

Output Types..... Open Collector – 100 mA max per channel
Pull-Up – Open Collector with 2.2K ohm internal resistor, 100 mA max per channel
Push-Pull – 20 mA max per channel
Line Driver – 20 mA max per channel (Meets RS 422 at 5 VDC supply)

Index..... Once per revolution.
0001 to 0474 CPR: Ungated
0475 to 4096 CPR: Gated to output A
See *Waveform Diagrams*.

Max Frequency ..... 200 kHz

Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.

Noise Immunity..... Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN50081-2

Quadrature..... 67.5° electrical or better is typical,
Edge Separation 54° electrical minimum at temperatures > 99° C

Rise Time..... Less than 1 microsecond

Mechanical

Max Shaft Speed..... 6000 RPM. Higher shaft speeds may be achievable; contact Customer Service.

Bore Tolerance ..... +0.0015"/-0.000"

User Shaft Tolerances
Radial Runout ..... 0.005"
Axial Endplay..... ±0.050"

Moment of Inertia ... 3.3×10^{-3} oz-in-sec^2 typical

Housing ..... All metal construction

Weight..... 2.60 lb with gland nut
3.00 lb with all other connector options
Note: All weights typical

Environmental

Storage Temp ..... -25° to 100° C

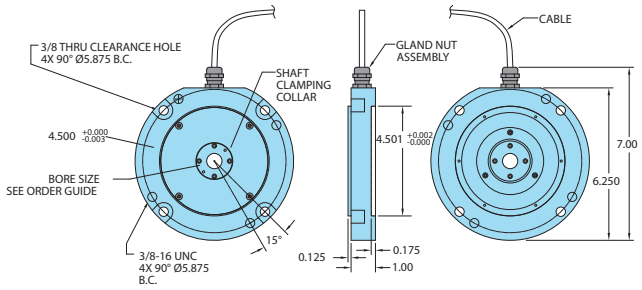
Humidity..... 98% RH non-condensing

Vibration..... 10 g @ 58 to 500 Hz

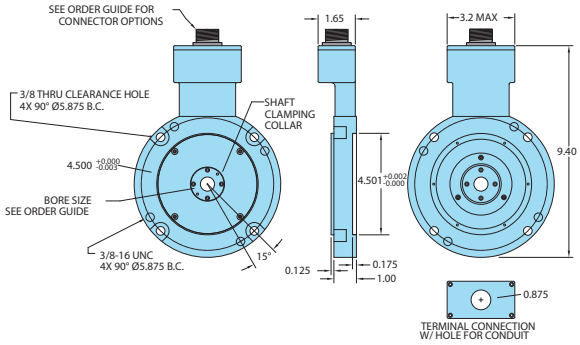
Shock..... 50 g @ 11 ms duration

Sealing ..... IP65 for Option A housing style with gasket kit; IP50 for Option B housing style

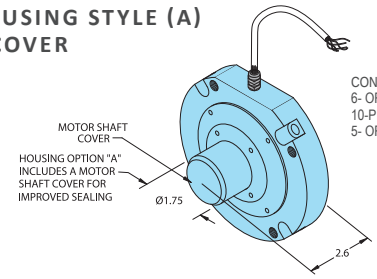
MODEL 770 WITH GLAND NUT (P)



MODEL 770 WITH CONDUIT BOX (B, X, Y, J, K)



OPTIONAL HOUSING STYLE (A) PROTECTIVE COVER

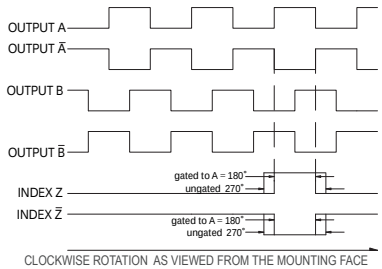


CONNECTOR TYPE	HEIGHT
6- OR 7-PIN MS	0.67"
10-PIN MS	0.90"
5- OR 8-PIN M12	0.50"

All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

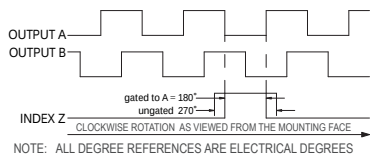
WAVEFORM DIAGRAMS

Line Driver and Push-Pull



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES.
WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV OUTPUT ONLY.

Open Collector and Pull-Up



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES
INDEX IS POSITIVE GOING

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.
Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	5-pin M12++ PU, PP, OC	8-pin M12++	10-pin MS	7-pin MS HV	7-pin MS PU, PP, OC	Term Block	10-pin Indust. Clamp
Com	Black	3	7	F	F	F	2	1
+VDC	Red	1	2	D	D	D	1	6
A	White	4	1	A	A	A	3	3
A'	Brown	--	3	H	C	--	4	8
B	Blue	2	4	B	B	B	5	2
B'	Violet	--	5	I	E	--	6	7
Z	Orange	5	6	C	--	C	7	4
Z'	Yellow	--	8	J	--	--	8	9
Case	--	--	--	G**	G**	G**	--	--
Shield	Bare*	--	--	--	--	--	9+	10+

*CE Option: Cable shield (bare wire) is connected to internal Case.
**CE Option: Pin G is connected to Case. Non-CE Option: Pin G has No Connection.
+CE Option: Pins 9 and 10 are connected to Case. Non CE Option: Pins 9 and 10 have No Connection.
++CE Option: Use cable cordset with shield connected to M12 connector coupling nut.
†Standard cable is 24 AWG conductors with foil and braid shield.

MODEL 771

Ø9.0"

FEATURES

Large Bore Size to 1.875" or 43 mm
Fits NEMA Size 182TC Thru 256TC Motor Faces (8.5" AK)
Incorporates Opto-ASIC Technology
Resolutions to 4096 CPR

The Model 771 C-Face encoder is a rugged, high resolution encoder designed to mount directly on NEMA C-Face motors. Both sides of the encoder are C-Face mounts, allowing additional C-Face devices to be easily mounted. Many competitive C-Face units are kit type encoders, but the Model 771 contains precision bearings and an internal flex mount that virtually eliminates encoder failures and inaccuracies induced by motor shaft runout or axial endplay. The advanced Opto-ASIC design provides superior noise immunity necessary for many industrial applications. This encoder is ideal for applications using induction motors and flux vector control. A Thru-Bore design allows fast and simple mounting of the encoder directly to the accessory shaft or drive shaft of a motor using a NEMA standard motor face (sizes 182TC - 256TC). The tough, all metal housing resists the vibration and hazards of an industrial environment.

COMMON APPLICATIONS

Motor Feedback, Velocity & Position Control, Servo Control Systems, Assembly & Specialty Machines, Elevator Controls

MODEL 771 ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

771 – A – H – 1024 – Q – OC – A – Y – N – N

MODEL
771 8.5" NEMA "AK" Dimension

OPERATING TEMPERATURE
S 0° to 70° C
H 0° to 100° C

HOUSING STYLE
A Cover completely encloses motor shaft and eliminates access to motor shaft; IP65 rated.
B Thru-Bore housing version with IP50 dust seal[1]

CYCLES PER REVOLUTION
1 - 4096
See *CPR Options* below for available resolutions.
Price adder for CPR >1024

NUMBER OF CHANNELS[2]
Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index
Channel B Leads A
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index
See http://www.encoder.com/literature/index-phasing.pdf for additional options, and waveforms.

OUTPUT TYPE
5 - 28V In/Out[3]
OC Open Collector
PU Pull-Up Resistor
PP Push-Pull
HV Line Driver[4]

BORE SIZE
T 5/8", 0.625"
V 7/8", 0.875"
W 1", 1.000"
A 1-1/8", 1.125"
K 1-1/4", 1.250"
B 1-3/8", 1.375"
C 1-1/2", 1.500"
D 1-5/8", 1.625"
F 1-3/4", 1.750"
E 1-7/8", 1.875"
H 28 mm
Q 30 mm
R 32 mm
L 35 mm
I 38 mm
J 40 mm
M 42 mm
N 43 mm

CONNECTOR TYPE[5]
P Gland Nut with 24" cable[6]
B Terminal Strip in Conduit Box
X 10-pin MS on Conduit Box
Y 7-pin MS on Conduit Box[4]
J 5-pin M12 (12 mm) on Conduit Box[4]
K 8-pin M12 (12 mm) on Conduit Box
L 10-pin Industrial Clamp

C-FACE GASKET KIT OPTION[1]
N No
Y Yes

MATING CONNECTOR
N No Connector
Y Yes

MODEL 771 CPR OPTIONS

0060 0100 0120 0240 0250 0256 0500
0512 1000 1024 2048 2500 4096

Contact Customer Service for other disk resolutions; not all disk resolutions available with all output types

NOTES:
1 Thru-Bore version may be IP65 sealed if mounted between two C-Face devices with optional gasket kit. Select 'Yes' under C-Face Gasket Kit Option.
2 Contact Customer Service for index gating options.
3 5 to 24 VDC max for high temperature option.
4 Line Driver Outputs not available with 5-pin M12 connector. Available with 7-pin MS connector only without Index Z.
5 For mating connectors, cables, and cordsets see Accessories at encoder.com.
For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
6 For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: P/6 = 6 feet of cable.

MODEL 771 SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 70° C
4.75 to 24 VDC for temperatures between 70° C to 100° C

Input Current ..... 100 mA max with no output load

Input Ripple..... 100 mV peak-to-peak at 0 to 100 kHz

Output Format..... Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the mounting face. See *Waveform Diagrams*.

Output Types..... Open Collector – 100 mA max per channel
Pull-Up – Open Collector with 2.2K ohm internal resistor, 100 mA max per channel
Push-Pull – 20 mA max per channe
Line Driver – 20 mA max per channel (Meets RS 422 at 5 VDC supply)

Index..... Once per revolution.
0001 to 0474 CPR: Ungated
0475 to 4096 CPR: Gated to output A
See *Waveform Diagrams*.

Max Frequency ..... 200 kHz

Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.

Noise Immunity..... Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN50081-2

Quadrature..... 67.5° electrical or better is typical,
Edge Separation 54° electrical minimum at temperatures > 99° C

Rise Time..... Less than 1 microsecond

Mechanical

Max Shaft Speed..... 3500 RPM. Higher shaft speeds may be achievable, contact Customer Service. 6000 RPM for 1.125", 1.250", 1.375", 28 mm, 30 mm, 32 mm bore diameter

User Shaft Tolerances
Radial Runout ..... 0.005"
Axial Endplay..... ±0.1"

Moment of Inertia ... 3.3 x 10^{-3} oz-in-sec^2 typical

Housing ..... All metal construction

Weight..... 7.0 lb typical

Environmental

Storage Temp ..... -25° to 100° C

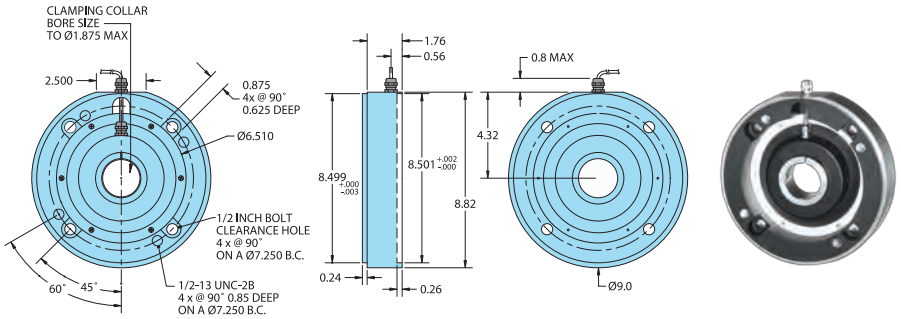
Humidity..... 98% RH non-condensing

Vibration..... 10 g @ 58 to 500 Hz

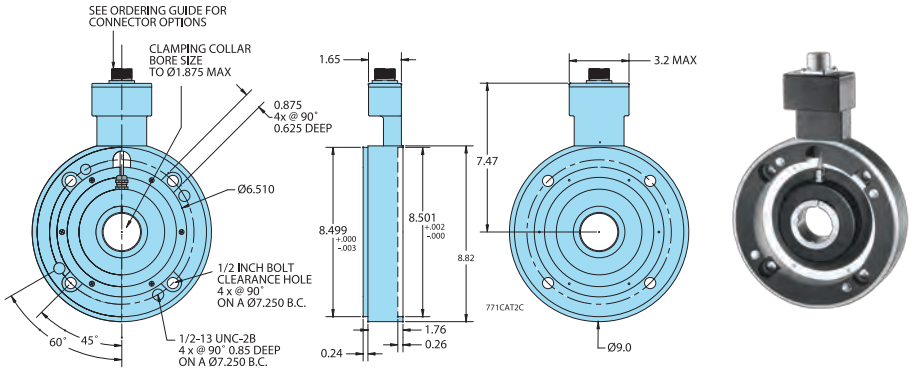
Shock..... 50 g @ 11 ms duration

Sealing ..... IP65 for Option A housing style with gasket kit; IP50 for Option B housing style

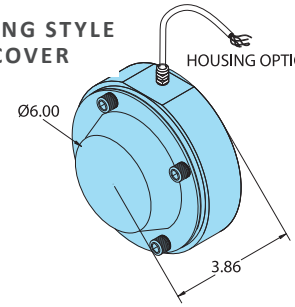
MODEL 771 WITH GLAND NUT CABLE (P)



MODEL 771 WITH CONDUIT BOX (B, X, Y, J, K)



OPTIONAL HOUSING STYLE (A) PROTECTIVE COVER

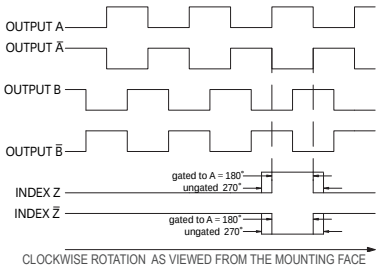


CONNECTOR TYPE	HEIGHT
6- OR 7-PIN MSW	0.67"
10-PIN MS	0.90"
5- OR 8-PIN M12	0.50"

All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

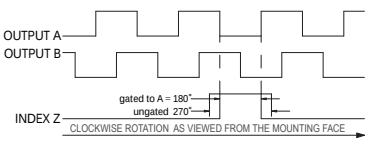
WAVEFORM DIAGRAMS

Line Driver and Push-Pull



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES.
WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV OUTPUT ONLY.

Open Collector and Pull-Up



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES
INDEX IS POSITIVE GOING

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable. Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	5-pin M12++ PU, PP, OC	8-pin M12++	10-pin MS	7-pin MS HV	7-pin MS PU, PP, OC	Term Block	10-pin Indust. Clamp
Com	Black	3	7	F	F	F	2	1
+VDC	Red	1	2	D	D	D	1	6
A	White	4	1	A	A	A	3	3
A'	Brown	--	3	H	C	--	4	8
B	Blue	2	4	B	B	B	5	2
B'	Violet	--	5	I	E	--	6	7
Z	Orange	5	6	C	--	C	7	4
Z'	Yellow	--	8	J	--	--	8	9
Case	--	--	--	G**	G**	G**	9+	10+
Shield	Bare*	--	--	--	--	--	--	--

*CE Option: Cable shield (bare wire) is connected to internal Case.
**CE Option: Pin G is connected to Case. Non-CE Option: Pin G has No Connection.
+CE Option: Pins 9 and 10 are connected to Case. Non CE Option: Pins 9 and 10 have No Connection.
++CE Option: Use cable cordset with shield connected to M12 connector coupling nut.
†Standard cable is 24 AWG conductors with foil and braid shield.

MODEL 711

FEATURES

The Original Industry-Standard Cube
Versatile Housing Styles
Unidirectional Output
Resolutions Available to 10,000 CPR

The Model 711 Accu-Coder™ is the original, industry standard cube encoder. Designed for compatibility with most programmable controllers, electronic counters, motion controllers, and motor drives, it is ideally suited for applications that require a simple, symmetrical, unidirectional square wave output in a single channel format. Critical performance specifications for the most popular resolutions and advanced Opto-ASIC circuitry – a single chip design that eliminates many board level components – increase the reliability of an already dependable and durable encoder. With new options continually being added, the Model 711 excels in a wide variety of industrial applications.

COMMON APPLICATIONS

Feedback for Counters, PLCs & Motors, Measuring for Packaging, Filling & Material Handling Machines, Wire Winding, Film Extrusion

MODEL 711 ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

711 – 0256 – S – HD1 – 6 – S – S – N

MODEL
711 Unidirectional Cube (Single Channel)

CYCLES PER REVOLUTION (CPR)
1-10,000
See *CPR Options* below for available resolutions.
(1271 and above is a price adder)

OUTPUT TYPE

S	Pull-Up Resistor
O	Open Collector
PP	Push-Pull
HV	Line Driver

HOUSING TYPE

S	2.25" Standard Housing
S1	2.25" Standard Housing with IP50 Felt Shaft Seal[1]
IND12	Industrial Housing with IP66 Shaft Seal
HD1	3" x 3" x 6" Heavy Duty Housing[2]
HD3	Heavy Duty Housing with Conduit Connector & Terminal Strip
HD5	Heavy Duty Housing with 10 mm Outer Bearing[2]
HD10	Heavy Duty Housing with Ultra Heavy Duty Bearings, 0.625" or 0.500" Shaft[2]
HD12	Heavy Duty Housing with IP66 Outer Shaft Seal[2]
HD14	Heavy Duty Housing with IP66 Shaft Seal and with Conduit Connector & Terminal Strip
5PY	Standard Cube With 5PY Adaptor[3]
EX	Explosion-proof Housing

SHAFT DIAMETER[4]

4	1/4", 0.250"[5]
5	5/16", 0.3125"[6]
6	3/8", 0.375"
8	1/2", 0.500"[7]
10	5/8", 0.625"[7]

SHAFT TYPE

S	Single
D	Double ended[8]

CONNECTOR TYPE[9]

S	Standard 6-pin MS
Y	7-pin MS
J	5-pin M12 (12 mm)[8]
K	8-pin M12 (12 mm)[8]
G	Gland Nut – 18" Cable[10]
T	Solder or Screw Terminal[11]
B	Solder Terminal with Conduit Box

MATING CONNECTOR

N	No Connector
Y	Yes

MODEL 711 CPR OPTIONS

0001 thru 0189*			0193	0198	0200	0205	0210	0240
0250	0256	0276	0298	0300	0305	0308	0315	0333
0336	0350	0360	0400	0480	0500	0512	0580	0597
0600	0700	0720	0800	0840	0960	1000	1024	1200
1250	1270	1500	1800*	2000	2048	2500	3000	3600*
4096	5000	6000	7200*	8192	10,000			

*Contact Customer Service for availability.

Contact Customer Service for other disk resolutions. Not all disk resolutions available with all output types.

NOTES:
1 Available with 0.250" shaft only.
2 Only available with 6-pin MS or Screw Terminal Connector Types.
3 Only available with 5/16", 0.3125" shaft.
4 Contact Customer Service for custom shaft lengths and diameters.
5 Standard housing only.
6 Standard or 5PY housing only.
7 HD10 housing only.
8 Not available for HD or EX housings.
9 For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
10 For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: G/6 = 6 feet of cable.
For CPR > 2500. Standard cable length only.
11 Screw terminals available for HD and EX housings. Solder terminals available for S and S1 housings.

MODEL 711 SPECIFICATIONS

Common to all cube housing styles.

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 85° C
4.75 to 24 VDC for temperatures between 85° C and 100° C.
Input Current..... 80 mA maximum with no output load
Input Ripple..... 100 mV peak-to-peak at 0 to 100 kHz
Output Format..... Incremental – Square wave with single channel
Output Types..... Open Collector – 250 mA max per channel
Pull-Up – Open Collector with 1.5K ohm internal resistor, 250 mA max per channel
Push-Pull – 20 mA max per channel
Line Driver – 20 mA max per channel (Meets RS 422 at 5 VDC supply)
Max Frequency ..... 1 to 2500 CPR 125 kHz
2501 to 5000 CPR 250 kHz
5001 to 10,000 CPR 500 kHz
Electrical Protection. .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.
Symmetry..... 180° (±18°) electrical
Rise Time..... Less than 1 microsecond
Accuracy..... Within 0.05° mechanical from one cycle to any other cycle, or 3 arc minutes.

Mechanical

Max Speed ..... 6000 RPM. Higher shaft speeds achievable, contact Customer Service.
Shaft Material ..... 303 Stainless Steel
Housing ..... Black non-corrosive finished 6063-T6 aluminum
Bearings..... Precision ABEC ball bearings

Environmental

Operating Temp ..... 0° to 85° C
Storage Temp ..... -25° to 85° C
Humidity..... 98% RH non-condensing
Vibration..... 10 g @ 58 to 500 Hz
Shock..... 50 g @ 11 ms duration

STANDARD CUBE HOUSING (S, S1) SPECIFICATIONS

Mechanical

Shaft Type ..... Single or double-ended (specify choice)
Radial Loading..... 15 lb maximum (0.250" diameter shaft)
40 lb maximum (0.375" diameter shaft)
Axial Loading..... 10 lb maximum (0.250" diameter shaft)
30 lb maximum (0.375" diameter shaft)
Starting Torque ..... 0.13 oz-in typical for 0.250" shaft
0.38 oz-in typical for 0.375" shaft
Moment of Inertia ... 6.5×10^{-6} oz-in-sec^2
Weight..... 10 oz for standard housing

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.

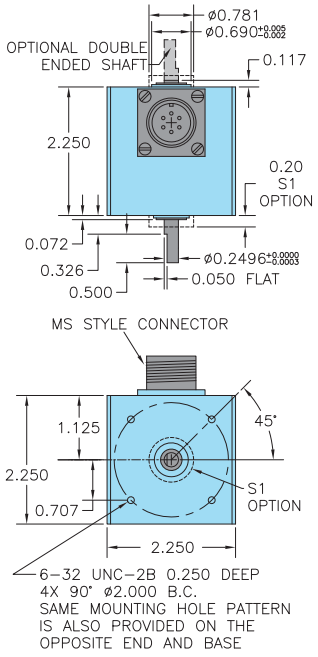
Function	Gland Cable† Wire Color	5-pin M12	8-pin M12	10-pin MS	7 pin MS HV	7-pin MS O,S PP	6-pin MS HV, No Index	6-pin MS O,S PP	Term. Block HV, No Index	Term. Block O,S HV,PP
Com	Black	3	7	F	F	F	A	A,F	1	1,6
+VDC	Red	1	2	D	D	D	B	B	2	2
A	White	4	1	A	A	A	C	D	3	4
A'	Brown	--	3	H	C	--	D	--	4	--
Case	--	--	--	G	G	G	--	--	--	--
Shield	Bare	--	--	--	--	--	--	--	--	--

†Standard cable is 24 AWG conductors with foil and braid shield.

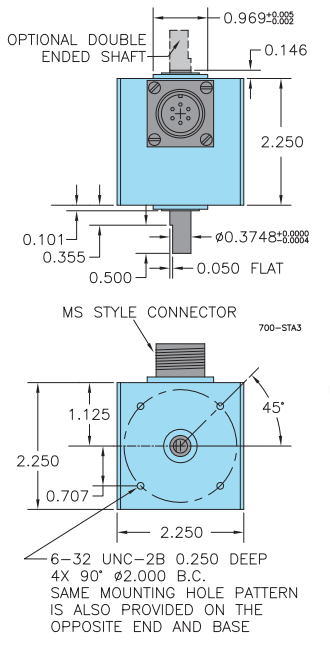
WAVEFORM DIAGRAM

STANDARD CUBE HOUSING (S, S1)

Cube Housing with 1/4" Shaft (4)



Cube Housing with 3/8" Shaft (6)



CUBE PIVOT MOUNTING BRACKETS

176430-01 Single Pivot
176431-01 Double Pivot
176430-02 Spring Loaded Single Pivot
176431-02 Spring Loaded Double Pivot

Encoder sold separately.

Dual Wheel

Single Wheel
(shown with Torsion Spring)

MODEL 715

FEATURES

The Original Industry-Standard Cube
Versatile Housing Styles
Bi-Directional, Constant Pulse Width
Resolutions Available up to 10,000 CPR

The Model 715 Accu-Coder™ is ideally suited for applications requiring bi-directional feedback with a constant pulse width. The Model 715 is available in two versions. The Model 715-1 provides output pulses for clockwise shaft rotation on one channel and pulses for counterclockwise rotation on another. The Model 715-2 provides output pulses for counting on one channel while the other channel indicates direction of rotation. Critical performance specifications for the most popular resolutions and advanced Opto-ASIC circuitry – a single chip design that eliminates many board level components – increases the reliability of an already dependable and durable encoder. With new options continually being added, the Model 715 excels in a wide variety of industrial applications.

COMMON APPLICATIONS

Measuring for Cut-to-Length, Labeling & Filling, Position Control, Motion Following, or Slaving Applications

MODEL 715 ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

715-1 – 0256 – .2 – N – S – HD1 – 6 – S – S – N

MODEL
715-1 Two Channels
715-2 One Channel and Direction Line

PULSES PER REVOLUTION (PPR) 2 - 10,000
See CPR Options below for available resolutions
(1202 and above is a price adder)

PULSE WIDTH
Values from .01 to 100 milliseconds

PULSE POLARITY
P Positive
N Negative

OUTPUT TYPE
S Pull-Up Resistor
O Open Collector

HOUSING TYPE

S	2.25" Standard Housing
S1	2.25" Standard Housing with IP50 Felt Shaft Seal[1]
IND12	Industrial Housing with IP66 Shaft Seal
HD1	3" x 3" x 6" Heavy Duty Housing[2]
HD3	Heavy Duty Housing with Conduit Connector & Terminal Strip
HD5	Heavy Duty Housing with 10 mm Outer Bearing[2]
HD10	Heavy Duty Housing with Ultra Heavy Duty Bearings, 0.625" or 0.500" Shaft[2]
HD12	Heavy Duty Housing with IP66 Outer Shaft Seal[2]
HD14	Heavy Duty Housing with IP66 Shaft Seal and with Conduit Connector & Terminal Strip
5PY	Standard Cube with 5PY Adaptor[3]
EX	Explosion-proof housing

SHAFT DIAMETER[4]

4	1/4", 0.250"[5]
5	5/16", 0.3125"[6]
6	3/8", 0.375"
8	1/2", 0.500"[7]
10	5/8", 0.625"[7]

SHAFT TYPE
S Single
D Double ended[8]

CONNECTOR TYPE[9]

S	Standard 6-pin MS
J	5-pin M12 (12 mm)[8]
K	8-pin M12 (12 mm)[8]
G	Gland Nut – 18" Cable[10]
T	Solder or Screw Terminal[11]
B	Solder Terminal with Conduit Box

MATING CONNECTOR
N No Connector
Y Yes

MODEL 715 PPR OPTIONS

0001 thru 0189*			0193	0198	0200	0205	0210	0240	0250
0256	0276	0298	0300	0305	0308	0333	0336	0350	0360
0400	0480	0500	0512	0597	0600	0700	0720	0800	0840
0960	1000	1024	1200	1250	1270	1800	2000	2048	2500

2x and 4x, of all of the above resolutions are available

*Contact Customer Service for availability.

Contact Customer Service for other disk resolutions. Not all disk resolutions available with all output types

NOTES:

1 Available with 0.250" shaft only.
2 Only available with 6-pin MS or Screw Terminal Connector Types.
3 Only available with 5/16", 0.3125" shaft.
4 Contact Customer Service for custom shaft lengths and diameters.
5 Standard housing only.
6 Standard or 5PY housing only.
7 HD10 housing only.
8 Not available for HD or EX housings.
9 For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
10 For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: G/6 = 6 feet of cable.
11 Screw terminals available for HD and EX housings. Solder terminals available for S and S1 housings.

MODEL 715 SPECIFICATIONS

Common to All Cube Housing Styles

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 85° C
4.75 to 24 VDC for temperatures between 85° to 100°C
Input Current ..... 80 mA maximum with no output load
Input Ripple..... 100 mV peak-to-peak at 0 to 100 kHz
Output Format..... Incremental – Square wave with timed output
Output Types..... Open Collector – 250 mA max per channel
Pull-Up – Open collector with 1.5K ohm internal resistor, 250 mA max per channel
Max Frequency ..... 0 to 125 kHz
Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.
Rise Time..... Less than 1 microsecond
Accuracy..... Within 0.05° mechanical from one cycle to any other cycle, or 3 arc minutes

Mechanical

Max Speed ..... 6000 RPM. Higher shaft speeds achievable, contact Customer Service.
Shaft Material ..... 303 Stainless Steel
Housing ..... Black non-corrosive finished 6063-T6 aluminum
Bearings..... Precision ABEC ball bearings

Environmental

Operating Temp ..... 0 to 85° C
Storage Temp ..... -25° to 85° C
Humidity..... 98% RH non-condensing
Vibration..... 10 g @ 58 to 500 Hz
Shock..... 50 g @ 11 ms duration

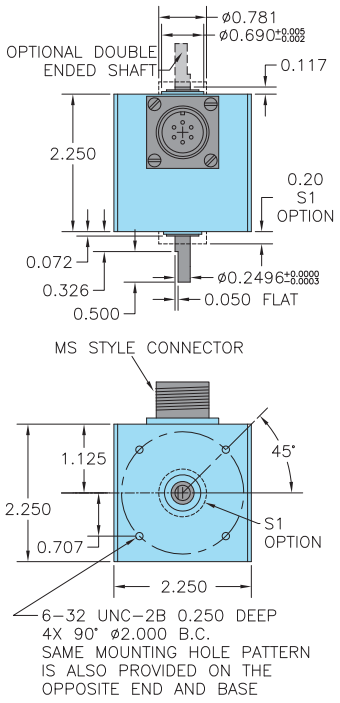
STANDARD CUBE HOUSING (S, S1) SPECIFICATIONS

Mechanical

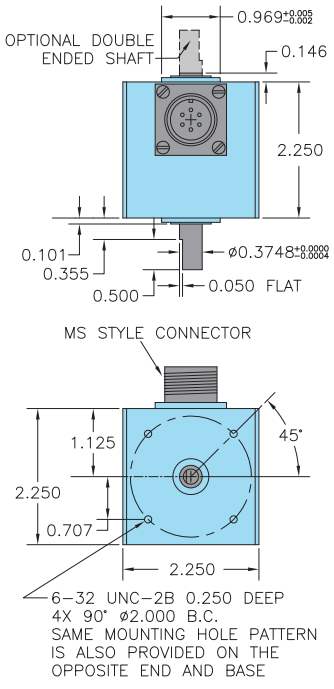
Shaft Type ..... Single or double-ended (specify choice)
Radial Loading ..... 15 lb maximum (0.250" diameter shaft)
40 lb maximum (0.375" diameter shaft)
Axial Loading..... 10 lb maximum (0.250" diameter shaft)
30 lb maximum (0.375" diameter shaft)
Starting Torque ..... 0.13 oz-in typical for 0.250" shaft
0.38 oz-in typical for 0.375" shaft
Moment of Inertia ... 6.5×10^{-6} oz-in-sec^2
Weight..... 10 oz for standard housing

STANDARD CUBE HOUSING (S, S1)

Cube Housing with 1/4" Shaft (4)



Cube Housing with 3/8" Shaft (6)



WIRING TABLE

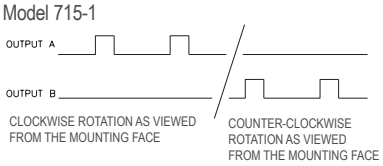
For EPC-supplied mating cables, refer to wiring table provided with cable.
Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	5-pin M12	8-pin M12	6-pin MS	Term. Block
Com	Black	3	7	A,F	1,6
+VDC	Red	1	2	B	2
A	White	4	1	D	4
B	Blue	2	4	E	5
Shield	Bare	--	--	--	--

†Standard cable is 24 AWG conductors with foil and braid shield.

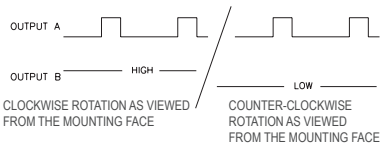
WAVEFORM DIAGRAMS

Model 715-1



Model 715-1 Bi-Directional Encoder
The 715-1 provides two output channels. A constant pulse width is generated on one channel with clockwise shaft rotation, and on the other channel with counter-clockwise shaft rotation. Specify PPR in any even numbered value between 2 and 10,000. Specify any pulse width from 10 microseconds to 100 milliseconds and pulse polarity. Some options require Heavy Duty housing. The Line Driver output option is not available.

Model 715-2



Model 715-2 Bi-Directional Encoder
The 715-2 provides two output channels. One channel has a constant pulse width output regardless of shaft rotation direction. The other channel indicates direction with logic level "1" for clockwise shaft rotation, and level "0" for counter-clockwise shaft rotation. Options are the same as for the Model 715-1.

CUBE PIVOT MOUNTING BRACKETS

176430-01 Single Pivot
176431-01 Double Pivot
176430-02 Spring Loaded Single Pivot
176431-02 Spring Loaded Double Pivot

Encoder sold separately.

Dual Wheel

Single Wheel
(shown with Torsion Spring)

MODEL 716

FEATURES

The Original Industry-Standard Cube
Five Versatile Housing Styles
Quadrature Output
New Resolutions Available to 10,000 CPR

The Model 716 Accu-Coder™ is ideally suited for applications requiring a quadrature output. Designed for compatibility with most programmable controllers, electronic counters, motion controllers, and motor drives, it is ideally suited for industrial applications where it is important that the direction of rotation be known. Critical performance specifications for the most popular resolutions and advanced Opto-ASIC circuitry – a single chip design that eliminates many board level components – increase the reliability of an already dependable and durable encoder. With new options continually being added, the Model 716 excels in a wide variety of industrial applications.

COMMON APPLICATIONS

Feedback for Counters, PLCs & Motors, Cut-to-Length, Labeling, Measuring for Packaging, Filling & Material Handling Machines, Wire Winding, Film Extrusion

MODEL 716 ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

716 – 0256 – 1 – N – S – HD1 – 6 – S – S – N

MODEL
716 Quadrature Cube

CYCLES PER REVOLUTION (CPR)
1-10,000
See *CPR Options* below for available resolutions.
(601 and above is a price adder)

INDEX PULSE
Blank No Index
1 Index Pulse

PULSE POLARITY[1]
P Positive
N Negative

OUTPUT TYPE
S Pull-Up Resistor
O Open Collector
PP Push-Pull
HV Line Driver

HOUSING TYPE

S	2.25" Standard Housing
S1	2.25" Standard Housing with IP50 Felt Shaft Seal[2]
IND12	Industrial Housing with IP66 Shaft Seal
HD1	3" x 3" x 6" Heavy Duty Housing[3]
HD3	Heavy Duty Housing with Conduit Connector & Terminal Strip
HD5	Heavy Duty Housing with 10 mm Outer Bearing[3]
HD10	Heavy Duty Housing with Ultra Heavy Duty Bearings, 0.625" or 0.500" Shaft[3]
HD12	Heavy Duty Housing with IP66 Outer Shaft Seal[3]
HD14	Heavy Duty Housing with IP66 Shaft Seal and with Conduit Connector & Terminal Strip
5PY	Standard Cube With 5PY Adaptor [4]
EX	Explosion-proof Housing

SHAFT DIAMETER[5]
4 1/4", 0.250" [6]
5 5/16", 0.3125" [7]
6 3/8", 0.375"
8 1/2", 0.500" [8]
10 5/8", 0.625" [8]

SHAFT TYPE
S Single
D Double ended[9]

CONNECTOR TYPE[10]
S Standard 6-pin MS
Y 7-pin MS
X 10-pin MS
J 5-pin M12 (12 mm)[9]
K 8-pin M12 (12 mm)[9]
G Gland Nut – 18" Cable[11]
T Solder or Screw Terminal[12]
B Solder Terminal with Conduit Box

MATING CONNECTOR
N No Connector
Y Yes

MODEL 716 CPR OPTIONS

0001 thru 0189*			0193	0198	0200	0205	0210	0240
0250	0256	0276	0298	0300	0305	0308	0315	0333
0336	0350	0360	0400	0480	0500	0512	0580	0597
0600	0700	0720	0800	0840	0960	1000	1024	1200
1250	1270	1500	1800*	2000	2048	2500	3000	3600*
4096	5000	6000	7200*	8192	10,000			

*Contact Customer Service for availability.

Contact Customer Service for other disk resolutions. Not all disk resolutions available with all output types.

NOTES:

1 Complete only if Index Pulse option is selected.
2 Available with 0.250" shaft only.
3 Only available with 6-pin MS or Screw Terminal Connector Types.
4 Only available with 5/16" (0.3125") shaft.
5 Contact Customer Service for custom shaft lengths and diameters.
6 Standard housing only.
7 Standard or 5PY housing only.
8 HD10 housing only.
9 Not available for HD or EX housings.
10 For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
11 For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: G/6 = 6 feet of cable. For CPR > 2500. Standard cable length only.
12 Screw terminals available for HD and EX housings. Solder terminals available for S and S1 housings.

MODEL 716 SPECIFICATIONS

Common to All Cube Housing Styles

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 85° C
4.75 to 24 VDC for temperatures between 85° C and 100° C.
Input Current ..... 80 mA maximum with no output load
Input Ripple..... 100 mV peak-to-peak at 0 to 100 kHz
Output Format ..... Incremental – Square wave with single channel
Output Types..... Open Collector – 250 mA max per channel
Pull-Up – Open collector with 1.5K ohm internal resistor, 250 mA max per channel
Push-Pull – 20 mA max per channel
Line Driver – 20 mA max per channel (Meets RS 422 at 5 VDC supply)
Max Frequency..... 1 to 2500 CPR 125 kHz, 2501 to 5000 CPR 250 kHz, 5001 to 10,000 CPR 500 kHz
Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.
Index..... Once per revolution, 180° electrical gated to Channel A. *See Waveform Diagrams*.
Quadrature..... 67.5° electrical or better is typical, 54° Edge Separation electrical minimum at temperatures > 99° C
Rise Time..... Less than 1 microsecond
Accuracy..... Within 0.05° mechanical from one cycle to any other cycle, or 3 arc minutes

Mechanical

Max Speed ..... 6000 RPM. Higher shaft speeds achievable, contact Customer Service.
Shaft Material ..... 303 Stainless Steel
Housing ..... Black non-corrosive finished 6063-T6 aluminum
Bearings..... Precision ABEC ball bearings

Environmental

Operating Temp ..... 0° to 85° C
Storage Temp ..... -25° to 85° C
Humidity..... 98% RH non-condensing
Vibration..... 10 g @ 58 to 500 Hz
Shock..... 50 g @ 11 ms duration

STANDARD CUBE HOUSING (S, S1) SPECIFICATIONS

Mechanical

Shaft Type ..... Single or double-ended (specify choice)
Radial Loading..... 15 lb maximum (0.250" diameter shaft)
40 lb maximum (0.375" diameter shaft)
Axial Loading..... 10 lb maximum (0.250" diameter shaft)
30 lb maximum (0.375" diameter shaft)
Starting Torque ..... 0.13 oz-in typical for 0.250" shaft
0.38 oz-in typical for 0.375" shaft
Moment of Inertia ... 6.5×10^{-6} oz-in-sec^2
Weight..... 10 oz for standard housing

WIRING TABLE

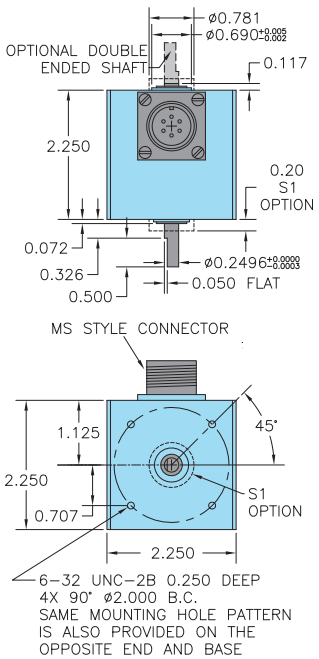
For EPC-supplied mating cables, refer to wiring table provided with cable.
Trim back and insulate unused wires.

Function	Cable† Wire Color	5-pin M12	8-pin M12	10-pin MS HV	7-pin MS HV	7-pin MS O,S,PP	6-pin MS HV,No Index	6-pin MS O,S,PP	Term. Block HV,No Index	Term. Block O,S,PP
Com	Black	3	7	F	F	F	A	A,F	1	1,6
+VDC	Red	1	2	D	D	D	B	B	2	2
A	White	4	1	A	A	A	C	D	3	4
A'	Brown	--	3	H	C	--	D	--	4	--
B	Blue	2	4	B	B	B	E	E	5	5
B'	Violet	--	5	I	E	--	F	--	6	--
Z	Orange	5	6	C	--	C	--	C	--	3
Z'	Yellow	--	8	J	--	--	--	--	--	--
Case	Green	--	--	G	G	G	--	--	--	--
Shield	Bare	--	--	--	--	--	--	--	--	--

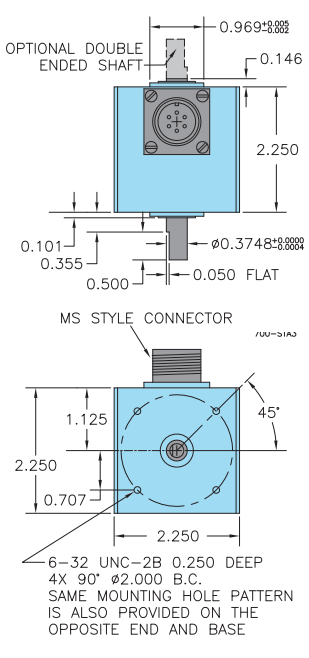
†Standard cable is 24 AWG conductors with foil and braid shield.

STANDARD CUBE HOUSING (S, S1)

Cube Housing with 1/4" Shaft (4)



Cube Housing with 3/8" Shaft (6)



CUBE PIVOT MOUNTING BRACKETS

Dual Wheel

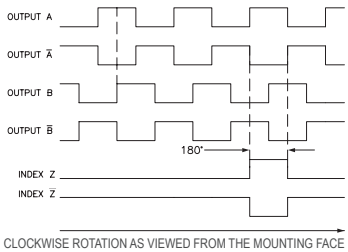
Single Wheel
(shown with Torsion Spring)

176430-01 Single Pivot
176431-01 Double Pivot
176430-02 Spring Loaded Single Pivot
176431-02 Spring Loaded Double Pivot

Encoder sold separately.

WAVEFORM DIAGRAMS

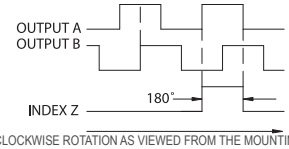
Line Driver and Push-Pull



CLOCKWISE ROTATION AS VIEWED FROM THE MOUNTING FACE

NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV OUTPUT ONLY.

Open Collector and Pull-Up



CLOCKWISE ROTATION AS VIEWED FROM THE MOUNTING FACE

CUBE HOUSINGS

INDUSTRIAL CUBE HOUSING (IND12)

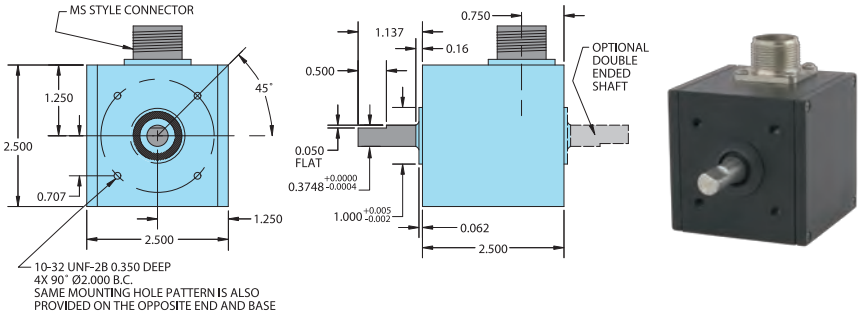
This more robust unit meets requirements between Standard and Heavy Duty housings while retaining the Cube design. The Industrial 12 (IND12) model features an IP66 shaft seal. The tough, sealed aluminum housing has a wall thickness of 0.187" and offers greater protection from wash down, sprays, dust, moisture, shock, vibration, and other hazards found in industrial environments.

INDUSTRIAL CUBE HOUSING (IND12) SPECIFICATIONS

Refer to all Standard Cube Housing specifications except as follows:

Mechanical

Shaft Size ..... 0.375" diameter
Shaft Type ..... Single- or Double-Ended Shaft Available
Radial Loading ..... 40 lb Maximum
Axial Loading ..... 30 lb Maximum
Starting Torque ..... 3 oz-in Starting Torque w/IP66 Shaft Seal



All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified

HEAVY DUTY CUBE HOUSING (HD12)

The Heavy Duty housing uses a separate 0.375" diameter external shaft and bearing assembly to rotate the shaft of an internally mounted Cube Housing. This provides mechanical isolation from external loads and stress. A flexible coupling between the external shaft and the encoder protects the internal unit from axial and radial loading. The 0.250" aluminum walls protect the encoder from external shock, vibration, and the outside environment.

Heavy Duty Housing Options

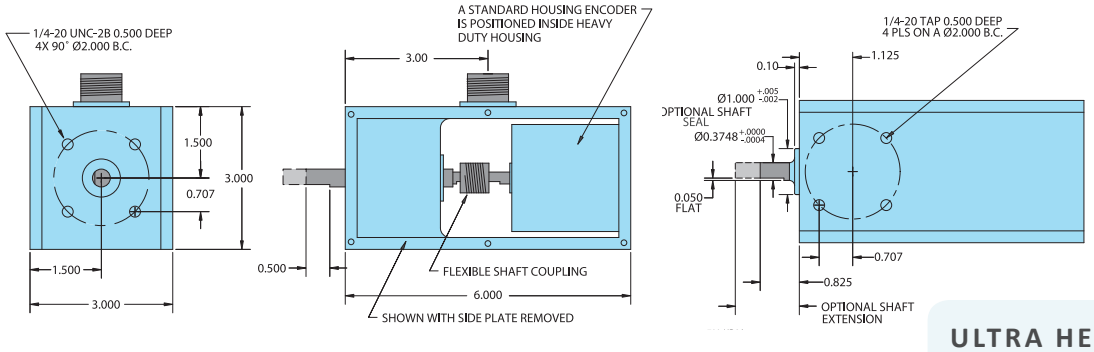
HD 1 Heavy Duty 3" x 6" housing
HD 3 Heavy Duty w/conduit connector (threaded for 0.500" NPT Conduit) and terminal strip
HD 5 Heavy Duty w/10 mm outer bearing
HD 12* Heavy Duty w/IP66 rated outer shaft seal
HD 14* Heavy Duty w/IP66 rated outer shaft seal, conduit connector (threaded for 0.500" NPT Conduit), and terminal strip
*These units have an outer boss diameter of 1.000"

HEAVY DUTY CUBE HOUSING (HD12) SPECIFICATIONS

Refer to all cube specifications except as follows:

Mechanical

Max Speed ..... 6000 RPM
Shaft Size ..... 0.375"
Rotation ..... Either direction
Radial Loading ..... 40 lb maximum (50 lb for HD 5)
Axial Loading ..... 30 lb maximum (35 lb for HD 5)
Bearings ..... Precision ABEC ball bearings
Starting Torque ..... 1 oz-in; 3 oz-in w/IP66 seal
Mounting ..... Tapped holes face and base
Weight ..... 3.25 lb



ULTRA HEAVY DUTY CUBE HOUSING (HD10)

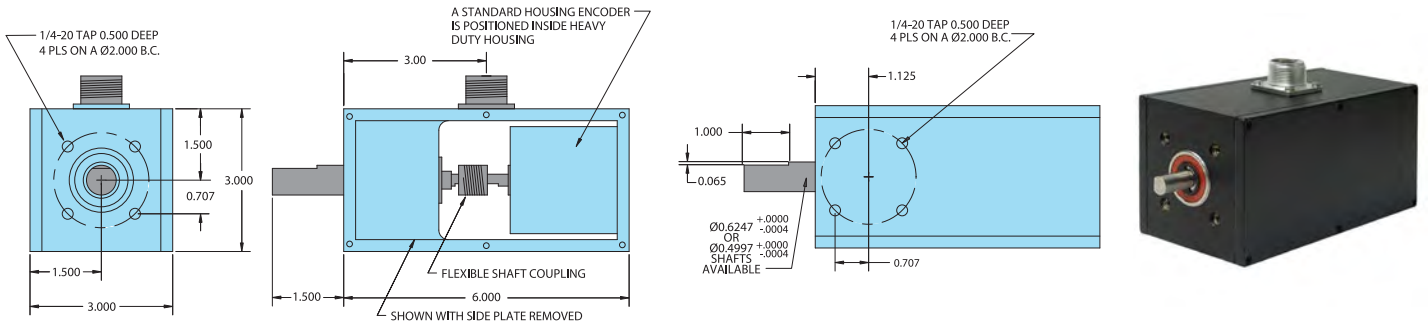
The HD 10 Ultra Heavy Duty encoder is designed for use in applications with severe shaft loading conditions. The HD 10 offers two shaft sizes: 0.500" and 0.625". Shaft material is 303 stainless steel. Bearings are conservatively rated at 95 lb radial and 60 lb axial shaft loading. IP66 shaft seal is standard on all units. The HD 10 Ultra Heavy Duty housing uses a larger external shaft and R10 bearing assembly to rotate the shaft of an internally mounted Cube Housing. This provides mechanical isolation from external loads and stress. A flexible coupling between the external shaft and the encoder protects the internal unit from axial and radial loading. The 0.250" aluminum walls protect the encoder from external shock, vibration, and the outside environment.

ULTRA HEAVY DUTY CUBE HOUSING (HD 10) SPECIFICATIONS

Mechanical

Max Speed ..... 6000 RPM
Shaft Size ..... 0.500" or 0.625"
Rotation ..... Either direction
Radial Loading ..... 95 lb operating
Axial Loading ..... 60 lb operating
Bearings ..... ABEC precision ball bearings
Bearing Life ..... 15,000 hours at rated load
Starting Torque ..... 3 oz-in IP66 rated
Mounting ..... Tapped holes face and base
Weight ..... 3.85 lb

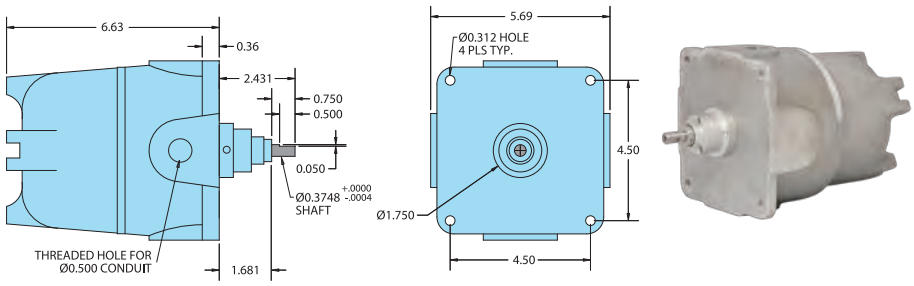
ULTRA HEAVY DUTY CUBE HOUSING (HD10)—CONT'D



All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified

EXPLOSION-PROOF HOUSING (EX)

An explosion-proof housing is available for installing the Cube Series Accu-Coder™ in hazardous locations. The Cube Series encoder is mounted within the explosion-proof housing and is coupled to the 0.375" shaft assembly by a flexible shaft coupling. This decreases radial and axial loading on the internal encoder shaft and bearings to ensure long life. Electrical connection to the Accu-Coder™ is by an internal barrier terminal strip. A threaded hole for 0.500" NPT conduit is provided.



EXPLOSION-PROOF HOUSING (EX) SPECIFICATIONS

The explosion-proof housing is designed to meet the following:
NEC Class 1, Groups C and D
NEC Class 2, Groups E, F, and G
UL Standard 1203
Class 1, Division 1, Groups C and D
Class 2, Division 1, Groups E, F, and G
CSA Standard C 22.2 No. 30-M 1986
NEMA 7 and NEMA 9

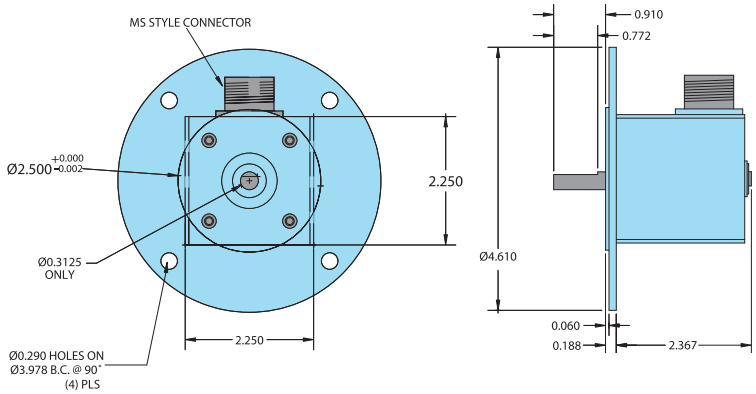
Refer to all cube specifications except as follows:

Mechanical

Max Speed ..... 4000 RPM
Radial Loading..... 30 lb operating
Axial Loading..... 10 lb operating
Weight..... 6 lb
Finish ..... Unpainted Aluminum

CUBE SERIES OPTIONAL 5PY ADAPTER (175443)

The all aluminum optional 5PY adapter allows any standard housing Cube Series encoder to replace DC tachometer technology. The 5PY adapter is interchangeable with any 5PY tach generator.



Order standard housing Cube Series Accu-Coder™ with 5/16" shaft and specify part #175443.

All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

MODEL 15S

Ø1.5"

FEATURES
High Performance Economical Encoder
Low Profile – Less Than 1.0" (25.4 mm) Height and 1.5" (38 mm) Diameter
Extended Temperature Operating Ranges Available
Up to 12 Pole Commutation Optional (for Brushless Motor Control)

The Model 15S Accu-Coder™ offers a high performance feedback solution in a low profile package, making the Model 15S ideal for commercial and light-duty industrial applications. This industry standard Size 15 (1.5" diameter) encoder features a precision bearing set, sealing available to IP64, a durable stainless steel shaft, and a selection of servo, flange, and face mount options. The Model 15S may also be specified with features such as extended operating temperatures from -40° C to 120° C, and up to 12 pole commutation for brushless motor control. The Model 15S features EPC's Opto-ASIC circuitry for a clean, reliable signal. Its durable yet economical design makes it an ideal encoder for high precision OEM applications.

COMMON APPLICATIONS
Servo Motor Control, Robotics, Medical Diagnostic Equipment, Specialty Assembly Machines, Digital Plotters, Printers, Typesetting Equipment

MODEL 15S ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Mechanical | Electrical | Optional Features (Leave Blank for Standard Options: -20° to 85° C Std, IP50 Std)

15S	–	19	M1	–	0500	N	5	A	OC	–	F00	–				

MODEL
15S Shaft Mount

SHAFT SIZE[1]
21 3/16", 0.1875"
23 4 mm
19 1/4", 0.250"
20 6 mm

MOUNTING
M1 3 hole 28 mm BC Servo Mount
M2 3 hole 1.210" BC Servo Mount
M3 2.093" Square Flange
M4 2.096" Servo Mount
M5 4 hole 1.100" Servo Mount
M6 4 hole 1.000" Servo Mount
M7 4 hole 1.181" Servo Mount
M8 3 hole 1.181/1.260" Servo Mount
M9 3 hole 1.210" BC Servo Mount

CYCLES PER REVOLUTION
See *CPR Options* below
Price adder >1800

COMMUTATION[2]
N No Commutation
A 4 Pole
B 6 Pole
C 8 Pole
E 10 Pole
D 12 Pole

INPUT VOLTAGE
5 5 VDC
V1 5 to 28 VDC

NUMBER OF CHANNELS[3]
A Channel A
Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index
Channel B Leads A[4]
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index

CONNECTOR TYPE[6]
F00 18" Cable[7] (Std)
F01 12" Cable
F02 24" Cable
F03 36" Cable
M002M Cable[7]
J00 18" Cable with 5-pin M12[8]
K00 18" Cable with 8-pin M12[8]
A00 15-pin Header with 18"Cable[9]

OUTPUT TYPE
OC Open Collector
PP Push-Pull
HV Line Driver
PU Pull-Up Resistor[5]
OD Open Collector with Differential Outputs
Available on special request.
Additional lead times may apply:
LO Line Driver on ABZ, Open Collector on UVW[5]

MAXIMUM FREQUENCY
Standard
F3 Extended
See Specifications

OPERATING TEMPERATURE
-20° to 85° C (Std)
T1 -40° to 85° C
T2 -20° to 100° C
T3 -20° to 120° C[10]
T7 -40° to 120° C[10]

SEALING
IP50 (Std)
S1 IP64

CERTIFICATION
None (Std)
CE CE Marked[11]

MODEL 15S CPR OPTIONS

0001 thru 0189*	0198	0200	0250	0256	0300	0315
0360	0400	0500	0512	0580	0600	0750
0800	1000	1024	1200	1250	1500	1800
2000	2048	2500	2540	3000	3600	4000
4096	5000	6000	7200	8192	10,000	

New CPR values are periodically added to those listed. Contact Customer Service to determine all currently available values. Special disk resolutions are available upon request and may be subject to a one-time NRE fee.

NOTES:
1 Contact Customer Service for additional options not shown.
2 Not available in all configurations, and not available with V1 Input Voltage. Contact Customer Service for availability.
3 Contact Customer Service for non-standard index gating or phase relationship options, or see Quadrature Phasing and Index Gating Options at encoder.com.
4 Reverse Quadrature not available with PU output type.
5 With Input Voltage above 16 VDC, operating temperature is limited to 85° C.
6 For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
7 For non-standard English cable lengths enter 'F' plus cable length expressed in feet. Example: F06 = 6 feet of cable. For non-standard metric cable lengths enter 'M' plus cable length expressed in meters. Example: M06 = 6 meters of cable. Frequency above 300 kHz standard cable lengths only.
8 Not available with commutation. 5-pin not available with Line Driver (HV, OD, LO) outputs. Additional cable lengths available. Please contact Customer Service.
9 Pin Header available with 5 VDC Input Voltage, HV Line Driver and standard quadrature phasing only. Not available with CE Certification. IP50 sealing option only.
10 Only available with 5 VDC Input Voltage.
11 Please refer to Technical Bulletin *TB100: When to Choose the CE Mark* at encoder.com.

MODEL 15S SPECIFICATIONS

Electrical

Input Voltage..... 5 VDC ±10% Fixed Voltage
4.75 to 28 VDC max for temperatures up to 85° C
4.75 to 24 VDC for temperatures between 85° to 100° C

Input Current..... 140 mA max (65 mA typical for most configurations) with no output load

Output Format..... Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mounting face.
See *Waveform Diagrams*.

Output Types..... Open Collector – 20 mA max per channel
Push-Pull – 20 mA max per channel
Pull-Up – Open Collector with 2.2K ohm internal resistor, 20 mA max per channel
Line Driver – 20 mA max per channel (Meets RS 422 at 5 VDC supply.)

Index..... Once per revolution.
1 to 189 CPR: Ungated
190 to 10,000 CPR: Gated to output A
See *Waveform Diagrams*.

Max. Frequency ..... Standard Frequency Response is
200 kHz for CPR 1 to 2540
500 kHz for CPR 2541 to 5000
1 MHz for CPR 5001 to 10,000
Extended Frequency Response (optional) is 300 kHz for CPR 2000, 2048, 2500, and 2540.

Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.

Noise Immunity..... Tested to BS EN61000-6-2; BS EN50081-2; BS EN61000-4-2; BS EN61000-4-3; BS EN61000-4-6; BS EN500811

Quadrature..... 67.5° electrical or better is typical,
Edge Separation 54° electrical minimum at temperatures > 99° C

Waveform Symmetry.. 180° (±18°) electrical (single channel encoder)

Accuracy..... Within 0.017° mechanical or 1 arc-minute from true position (for CPR >189).

Commutation..... Up to 12 pole. Contact Customer Service for availability.

Comm. Accuracy..... 1° mechanical

Mechanical

Max Shaft Speed..... 8000 RPM. Higher speeds may be achievable, contact Customer Service.

Shaft Material ..... Stainless Steel

Radial Shaft Load .... 5 lb max. Rated load of 2 to 3 lb for bearing life of 1.2 x 10^{10} revolutions

Axial Shaft Load ..... 5 lb max. Rated load of 2 to 3 lb for bearing life of 1.2 x 10^{10} revolutions

Starting Torque ..... IP50- 0.05 oz-in
IP64- 0.4 oz-in

Moment of Inertia ... 6.7 x 10^{-5} oz-in-sec^2 (4.8 gm-cm^2)

Weight..... 3 oz typical

Environmental

Storage Temp ..... -25° to 85° C

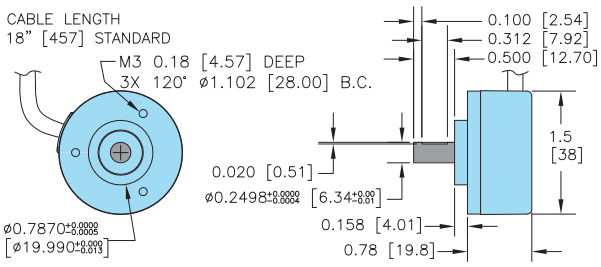
Humidity..... 98% RH non-condensing

Vibration..... 10 g @ 58 to 500 Hz

Shock..... 80 g @ 11 ms duration

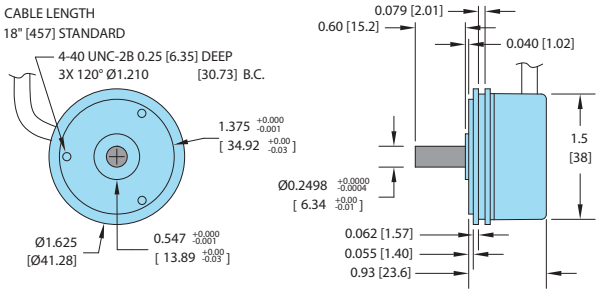
Sealing..... IP50 standard; IP64 available

MODEL 15S STANDARD SERVO MOUNT M1

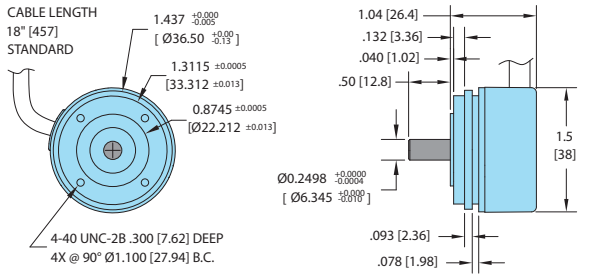


MODEL 15S SERVO MOUNT M2 & M9*

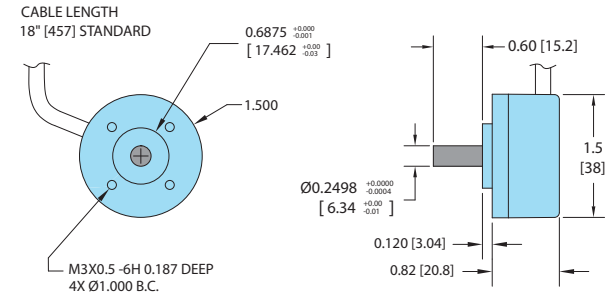
*M9 mount includes a 0.750" boss



MODEL 15S SERVO MOUNT M5



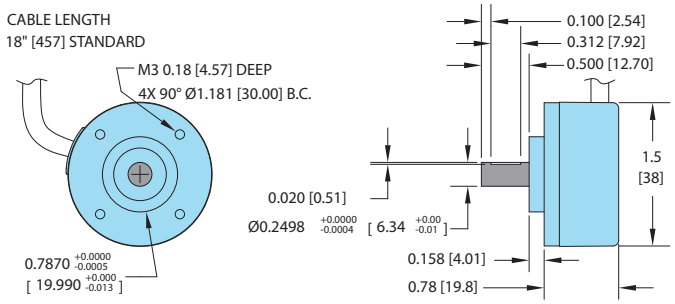
MODEL 15S SERVO MOUNT M6



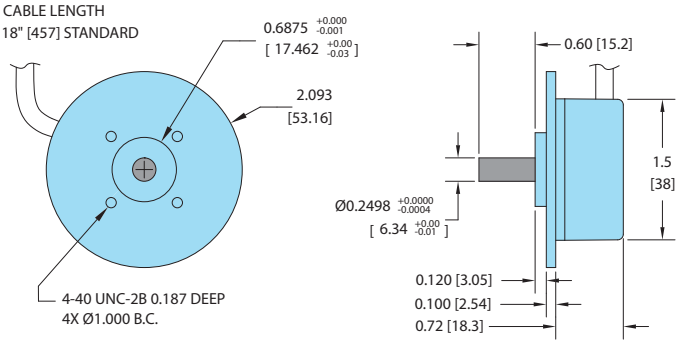
All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.
Metric dimensions are given in brackets [mm].

MODEL 15S

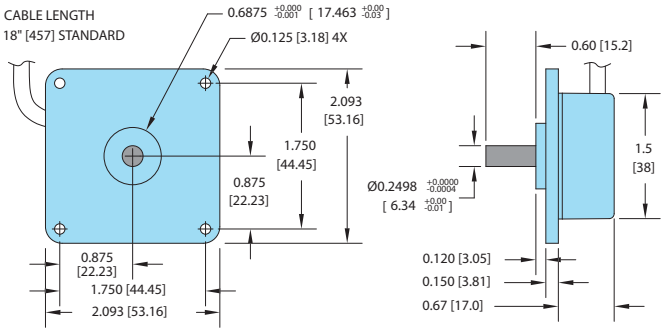
MODEL 15S SERVO MOUNT M7



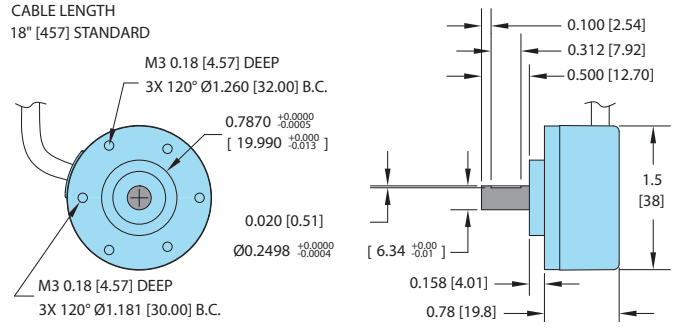
MODEL 15S SERVO MOUNT M4



MODEL 15S SQUARE FLANGE M3

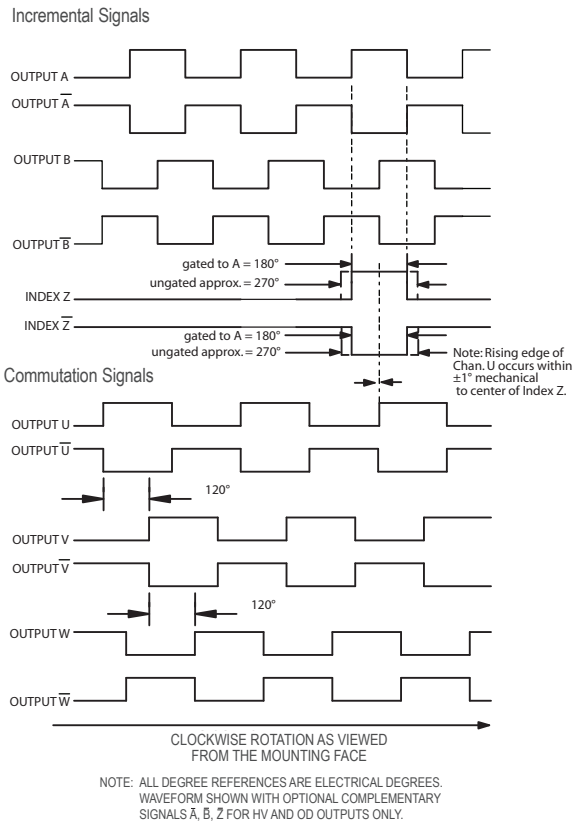


MODEL 15S SERVO MOUNT M8



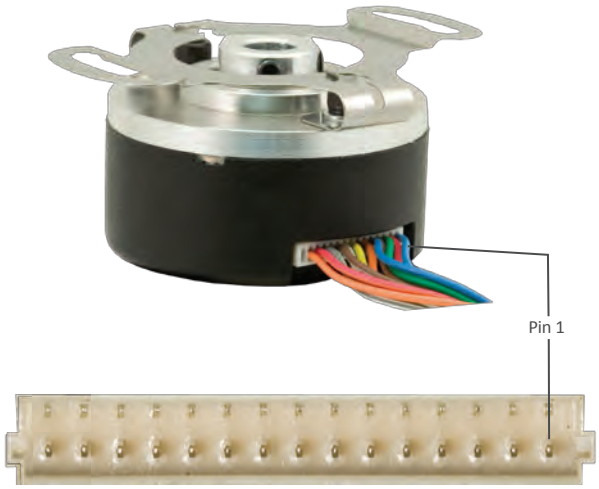
All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.
Metric dimensions are given in brackets [mm].

WAVEFORM DIAGRAMS



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS $\overline{A}$, $\overline{B}$, $\overline{Z}$ FOR HV AND OD OUTPUTS ONLY.

15-PIN HEADER



WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.
Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	5-pin M12**	8-pin M12**	15-pin Header
Com	Black	3	7	1
+VDC	White	1	2	2
A	Brown	4	1	4
A'	Yellow	--	3	3
B	Red	2	4	6
B'	Green	--	5	5
Z	Orange	5	6	7
Z'	Blue	--	8	8
U	Violet	--	--	10
U'	Gray	--	--	9
V	Pink	--	--	14
V'	Tan	--	--	13
W	Red/Green	--	--	12
W'	Red/Yellow	--	--	11
Shield	Bare*	--	--	--

*CE Option: Cable shield (bare wire) is connected to internal case.
†Standard cable for non-commutated models is 24 AWG; for commutated units, conductors are 28 AWG.
**CE Option: Use cable cordset with shield connected to M12 connector coupling nut.

MODEL 755A

Ø1.5"

FEATURES

Miniature Size (1.5" Diameter)
Up to 30,000 CPR
Servo or Flange Mounting
1 MHz Frequency Response Available
Extended Temperature Operating Range Available

The Model 755A Size 15 Accu-Coder™ is ideal for applications requiring a small, high precision, high performance encoder. Approximately 1.5" in diameter and 1.5" long, it will fit where many encoders cannot. Designed with all-metal construction and shielded ball bearings, it will provide years of trouble-free use. The standard servo mount (S) version is available with a variety of shaft sizes and lengths. Three additional servo style mounts (S1, S2, S3) are also available. The optional flange mounting (MF) is ideal for applications requiring a bolt-on, high precision encoder. With its high reliability and quick delivery, the Model 755A encoder is the perfect replacement encoder in this size category.

COMMON APPLICATIONS

Robotics, Assembly Machines, Motor-Mounted Feedback, Phototypesetters, Printers & Digital Plotters, Elevator Controls, Medical Diagnostic Equipment

MODEL 755A ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

755A – 07 – S – 1000 – R – HV – 1 – S – S – CE

MODEL
755A Model 755A

SHAFT SIZE[1]
07 1/4", 0.250"
08 5 mm
06 6 mm
32 1/4", 0.250" Servo 1,2,or 3 only
20 6 mm x 0.500"
19 1/4", 0.250" x 0.500"

OPERATING TEMPERATURE
L -40° to 70° C[2]
S 0° to 70° C
H 0° to 100° C[3]

CYCLES PER REVOLUTION
1-30,000
See *CPR Options* below for available resolutions.
Price adder for CPR >1270

NUMBER OF CHANNELS[4]
A Channel A
Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index
Channel B Leads A
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index

OUTPUT TYPE
5 - 28V In/Out[5]
OC Open Collector
PU Pull-Up Resistor
PP Push-Pull
HV Line Driver[6]
8 - 28V In/5V Out[7]
H5 Line Driver[6,8]
P5 Push-Pull[7]

MAXIMUM FREQUENCY
1 Standard 100 kHz
2 200 kHz ≤ 3000 CPR
5 250 kHz, >3000 CPR
3 500 kHz, >6000 CPR[9]
4 1 MHz, >10,000 CPR[9]

MOUNTING & HOUSINGS
S Standard Servo Mount
MF Square Flange
S1 Servo Mount (Choose shaft 32)
S2 Servo Mount (Choose shaft 32)
S3 Servo Mount (Choose shaft 32)

CONNECTOR TYPE[10]
S Standard 18" Cable[11]
C01 8-pin Molex
C02 Terminal Block
J00 18" Cable with 5-pin M12[6,12]
K00 18" Cable with 8-pin M12[12]

CERTIFICATION
N None
CE CE Marked[8,13]

MODEL 755A CPR OPTIONS

0001*	0002*	0004*	0005*	0006*	0007*	0008*	0010*	0011*
0012*	0014*	0020	0021*	0024*	0025*	0028*	0030*	0032*
0033*	0034*	0035*	0038*	0040*	0042*	0045*	0050*	0060
0064*	0100	0120	0125	0128*	0144*	0150*	0160*	0192*
0200	0240*	0250	0254*	0256*	0300	0333*	0336*	0360
0400	0500	0512	0600	0625*	0635	0665*	0720	0768*
0800	0889	1000	1024	1200	1201*[a]	1203*[a]	1204*[a]	1250[a]
1270[a]	1440	1500	1800	2000	2048	2400[a]	2500	2540[a]
2880[a]	3000[a]	3600[a]	4000[a]	4096[a]	5000[a]	6000[a]	7200[a]	7500[a]
9000[a]	10,000[a]	10,240[a]	12,000[a]	12,500[a]	14,400[a]	15,000[a]	18,000[a]	20,000[a]
20,480[a]	25,000[a]	30,000[a]						

*Contact Customer Service for High Temperature Option (H).
[a]High Temperature Option (H) limited to 85° C maximum for these CPR options.

New CPR values are periodically added to those listed. Contact Customer Service to determine all currently available CPR values. Special disk resolutions are available upon request. A one-time NRE fee may apply.

NOTES:

1 Contact Customer Service for additional options.
2 Low temperature option not available with resolutions of 3000 CPR or higher.
3 0° to 85° C for certain resolutions, see CPR Options.
4 Contact Customer Service for index gating options.
5 24 VDC max for high temperature option.
6 5-pin not available with Line Driver (HV, H5) outputs.
7 Standard temperature, 60 to 3000 CPR only. Not available with 2540 CPR.
8 H5 and P5 outputs are not available with CE option.
9 Standard cable lengths only. For details, please refer to Technical Bulletin ***TB116: Noise and Signal Distortion Considerations*** at encoder.com.
10 For mating connectors, cables, and cordsets see **Accessories** at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see **Connector Pin Configuration Diagrams** at encoder.com.
11 For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: S/6 = 6 feet of cable.
12 Additional cable lengths available. Please consult Customer Service.
13 Please refer to Technical Bulletin ***TB100: When to Choose the CE Mark*** at encoder.com.

MODEL 755A SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 70° C
4.75 to 24 VDC for temperatures between 70° C to 100° C
Input Current ..... 100 mA max with no output load
Input Ripple..... 100 mV peak-to-peak at 0 to 100 kHz
Output Format..... Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mounting face.
See *Waveform Diagrams*.
Output Types..... Open Collector – 100 mA max per channel
Pull-Up – Open Collector with 2.2K ohm internal resistor, 100 mA max per channel
Push-Pull – 20 mA max per channel
Line Driver – 20 mA max per channel
(Meets RS 422 at 5 VDC supply)
Index..... Occurs once per revolution. The index for units >3000 CPR is 90° gated to Outputs A and B. See *Waveform Diagrams*.
Max Frequency ..... 100 kHz std; Up to 1 MHz optional. (See Ordering Guide for availability)
Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.
Noise Immunity..... Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN50081-2
Symmetry..... 1 to 6000 CPR: 180° (±18°) electrical at 100 kHz output
6001 to 20,480 CPR: 180° (±36°) electrical
Quad Phasing..... 1 to 6000 CPR: 90° (±22.5°) electrical at 100 kHz output
6001 to 20,480 CPR: 90° (±36°)
Min Edge Sep ..... 1 to 6000 CPR: 67.5° electrical at 100 kHz output
6001 to 20,480 CPR: 54° electrical
>20,480 CPR: 50° electrical
Rise Time..... Less than 1 microsecond
Accuracy..... Instrument and Quadrature Error: For 200 to 1999 CPR, 0.017° mechanical (1.0 arc minutes) from one cycle to any other cycle. For 2000 to 3000 CPR, 0.01° mechanical (0.6 arc minutes) from one cycle to any other cycle. Interpolation error (units > 3000 CPR only) within 0.005° mechanical. (Total Optical Encoder Error = Instrument + Quadrature + Interpolation)

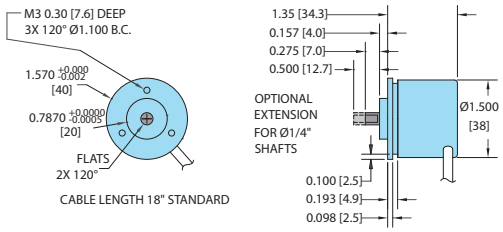
Mechanical

Max Speed ..... 7500 RPM. Higher shaft speeds may be achievable, contact Customer Service.
Shaft Rotation ..... Bi-directional
Radial Shaft Load ..... 5 lb
Axial Shaft Load ..... 3 lb
Starting Torque ..... 0.14 oz-in typical
4.0 oz-in typical for -40° C operation
Moment of Inertia ... 2.8×10^{-4} oz-in-sec^2
Housing ..... Black non-corrosive finish
Bearings..... Precision ABEC ball bearings
Weight..... 3.10 oz servo mount, typical

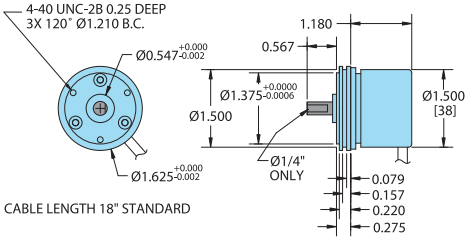
Environmental

Storage Temp ..... -25° to 85° C
Humidity..... 98% RH non-condensing
Vibration..... 10 g @ 58 to 500 Hz
Shock..... 50 g @ 11 ms duration

MODEL 755A STANDARD SERVO MOUNT (S)

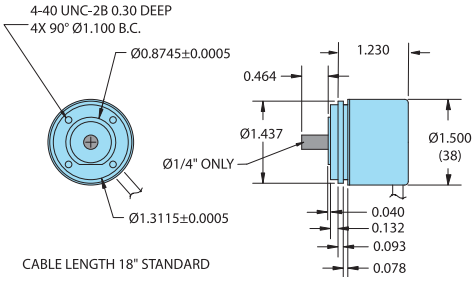


MODEL 755A SERVO MOUNTS (S1 & S2)

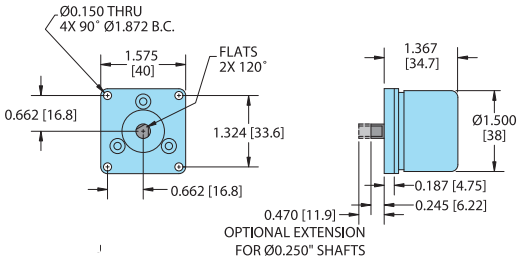


S2 Pictured below has a 0.750" Boss. S1 has a 0.547" Boss. See www.encoder.com to download drawings

MODEL 755A SERVO MOUNT (S3)



MODEL 755A 1.575" SQUARE FLANGE (MF)



All dimensions are in inches with a tolerance of ±0.005" or ±0.01".
unless otherwise specified metric dimensions are given in brackets [mm].

WIRING TABLE

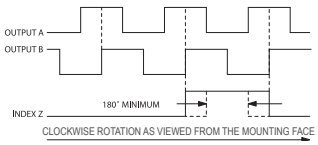
For EPC-supplied mating cables, refer to wiring table provided with cable.
Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	Term. Block	8-pin Molex	5-pin M12**	8-pin M12**
Com	Black	7	2	3	7
+VDC	White	8	1	1	2
A	Brown	1	8	4	1
A'	Yellow	2	7	--	3
B	Red	3	4	2	4
B'	Green	4	3	--	5
Z	Orange	6	6	5	6
Z'	Blue	5	5	--	8
Shield	Bare*	--	--	--	--

*CE Option: Cable shield (bare wire) is connected to internal case.
†Standard cable is 24 AWG conductors with foil and braid shield.
**CE Option: Use cable cordset with shield connected to M12 connector coupling nut.

WAVEFORM DIAGRAMS

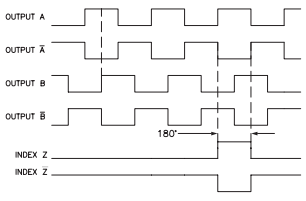
Open Collector and Pull-Up



CLOCKWISE ROTATION AS VIEWED FROM THE MOUNTING FACE

NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. INDEX IS PO=SITIVE GOING.

Line Driver and Push-Pull



CLOCKWISE ROTATION AS VIEWED FROM THE MOUNTING FACE

NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV OUTPUT ONLY.

MODEL 702

FEATURES

Standard Size 20 Package (2x2)
Flange and Servo Mounting
Up to 30,000 CPR
80 lb Maximum Axial and Radial Shaft Loading
IP67 Sealing Available

The Model 702 Size 20 Accu-Coder™ is a heavy duty, extremely rugged, reliable, yet compact industry standard 2" diameter encoder, designed for harsh factory and plant floor environments. The double shielded ball bearings are rated at 80 lb maximum axial and radial shaft loading to ensure a long operating life. Made to withstand the harsh effects of the real world, both the flange and servo models are rated IP67 with the optional heavy duty shaft seal. With a variety of mounting options in both the flange and servo models, the Model 702 is ideal for both new applications and replacements. If you need an encoder that won't let you down, the Model 702 is it.

COMMON APPLICATIONS

Motion Control Feedback, Conveyors, Elevator Controls, Machine Control, Food Processing, Process Control, Robotics, Material Handling, Textile Machines

MODEL 702 ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

702	–	20	–	S	–	1000	–	R	–	HV	–	1	–	F	–	1	–	E	X	–	N	–	CE

MODEL
702 Size 20 (2.0")

SHAFT SIZE[1]
07 1/4", 0.250"
20 3/8", 0.375"
21 10 mm
30 3/8", 0.375"[2]
24 1/4", 0.250" No Flat

OPERATING TEMPERATURE
S 0° to 70° C
L -40° to 70° C[3]
H 0° to 100° C[4]

CYCLES PER REVOLUTION
1-30,000
See *CPR Options* below for available resolutions.
Price adder for CPR >1270

NUMBER OF CHANNELS[5]
A Channel A
Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index
Channel B Leads A
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index

OUTPUT TYPE
5 - 28V In/Out[6]
OC Open Collector
PU Pull-Up Resistor
PP Push-Pull
HV Line Driver[7]
8 - 28V In/5V Out[8,9]
H5 Line Driver[7]
P5 Push-Pull

MAXIMUM FREQUENCY
1 100 kHz (Standard)
2 200 kHz ≤ 3000 CPR
5 250 kHz, > 3000 CPR
3 500 kHz, > 6000 CPR[10]
4 1 MHz, > 10,000 CPR[10]

SEALING
N No Seal
1 IP66
2 IP64
5 IP67

MOUNTING
Flange Mounts
F 1.181" Female Pilot
L 0.687" Male Pilot
G 1.250" Male Pilot
K Size 25 w/30 Shaft
Servo Mounts
S w/1.181" Female Pilot
U S w/0.687" Male Pilot
T S w/1.250" Male Pilot
C w/1.181" Female Pilot
E C w/0.687" Male Pilot
D C w/1.250" Male Pilot
P w/1.181" Female Pilot
Q P w/0.687" Male Pilot
R P w/1.250" Male Pilot
J Size 25 w/30 Shaft

CONNECTOR LOCATION
E End
S Side

CONNECTOR TYPE[11]
W 6-pin MS[7]
Y 7-pin MS[7]
X 10-pin MS
9D 9-pin D-subminiature
J 5-pin M12 (12 mm)[7]
K 8-pin M12 (12 mm)
G Gland, 24" Cable[12]
H 10-pin Bayonet

MATING CONNECTOR
N No
Y Yes

CERTIFICATION
N None
CE CE Marked[13]

MODEL 702 CPR OPTIONS

0001*	0002*	0004*	0005*	0006*	0007*	0008*	0010*	0011*
0012*	0014*	0020	0021*	0024*	0025*	0028*	0030*	0032*
0033*	0034*	0035*	0038*	0040*	0042*	0045*	0050*	0060
0064*	0100	0120	0125	0128*	0144*	0150*	0160*	0192*
0200	0240*	0250	0254*	0256*	0300	0333*	0336	0360
0400	0500	0512	0600	0625*	0635	0665*	0720	0768*
0800	0889	1000	1024	1200	1201*[a]	1203*[a]	1204*[a]	1250[a]
1270[a]	1440	1500	1800	2000	2048	2400[a]	2500	2540[a]
2880[a]	3000[a]	3600[a]	4000[a]	4096[a]	5000[a]	6000[a]	7200[a]	7500[a]
9000[a]	10,000[a]	10,240[a]	12,000[a]	12,500[a]	14,400[a]	15,000[a]	18,000[a]	
20,000[a]	20,480[a]	25,000[a]	30,000[a]					

*Contact Customer Service for High Temperature Option.
[a]High Temperature Option (H) limited to 85° C maximum for these CPR options.

New CPR values are periodically added to those listed. Contact Customer Service to determine all currently available CPR values. Special disk resolutions are available upon request. A one-time NRE fee may apply.

NOTES:
1 Contact Customer Service for additional options.
2 Shaft with Size 25 Mounting Adapter, J or K mounting only.
3 Low temperature option not available with resolutions of 3000 CPR or higher.
4 0° to 85° C for certain resolutions, see CPR Options.
5 Contact Customer Service for non-standard index gating options.
6 24 VDC max for high temperature option.
7 Line Driver not available with 5-pin M12 or 6-pin MS connector. Available with 7-pin MS connector only without Index Z.
8 Standard temperature, 60 to 3000 CPR only. Not available with 2540 CPR.
9 H5 and P5 outputs are not available with CE option, or any End Mount MS Connector.
10 Standard cable lengths only. For details, please refer to Technical Bulletin ***TB116: Noise and Signal Distortion Considerations*** at encoder.com.
11 For mating connectors, cables, and cordsets see **Accessories** at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see **Connector Pin Configuration Diagrams** at encoder.com.
12 For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: G/6 = 6 feet of cable.
13 Please refer to Technical Bulletin ***TB100: When to Choose the CE Mark*** at encoder.com.

MODEL 702 SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 70° C
4.75 to 24 VDC for temperatures between 70° C and 100° C

Input Current..... 100 mA max with no output load

Input Ripple..... 100 mV peak-to-peak at 0 to 100 kHz

Output Format..... Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mounting face. See *Waveform Diagrams*.

Output Types..... Open Collector – 100 mA max per channel
Pull-Up – Open Collector with 2.2K ohm internal resistor, 100 mA max per channel
Push-Pull – 20 mA max per channel
Line Driver – 20 mA max per channel (Meets RS 422 at 5 VDC supply)

Index..... Occurs once per revolution. The index for units >3000 CPR is 90° gated to Outputs A and B. See *Waveform Diagrams*.

Max Frequency..... Up to 1 MHz

Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.

Noise Immunity..... Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN50081-2

Symmetry..... 1 to 6000 CPR: 180° (±18°) electrical at 100 kHz output
6001 to 20,480 CPR: 180° (±36°) electrical

Quad Phasing..... 1 to 6000 CPR: 90° (±22.5°) electrical at 100 kHz output
6001 to 20,480 CPR: 90° (±36°) electrical

Min Edge Sep..... 1 to 6000 CPR: 67.5° electrical at 100 kHz output
6001 to 20,480 CPR: 54° electrical
>20,480 CPR: 50° electrical

Rise Time..... Less than 1 microsecond

Accuracy..... Instrument and Quadrature Error: For 200 to 1999 CPR, 0.017° mechanical (1.0 arc minutes) from one cycle to any other cycle. For 2000 to 3000 CPR, 0.01° mechanical (0.6 arc minutes) from one cycle to any other cycle. Interpolation error (units > 3000 CPR only) within 0.005° mechanical. (Total Optical Encoder Error = Instrument + Quadrature + Interpolation)

Mechanical

Max Shaft Speed..... 8000 RPM. Higher shaft speeds may be achievable, contact Customer Service.

Shaft Rotation..... Bi-directional

Radial Shaft Load..... 80 lb max. Rated load of 20 to 40 lb for bearing life of 1.5 x 10^9 revolutions

Axial Shaft Load..... 80 lb max. Rated load of 20 to 40 lb for bearing life of 1.5 x 10^9 revolutions

Starting Torque..... 1.0 oz-in typical with IP64 seal or no seal
3.0 oz-in typical with IP66 shaft seal
7.0 oz-in typical with IP67 shaft seal

Moment of Inertia.... 5.2 x 10^{-4} oz-in-sec^2

Housing..... Black non-corrosive finish

Bearings..... Precision ABEC ball bearings

Weight..... 11 oz typical

Environmental

Storage Temp..... -25° to 85° C

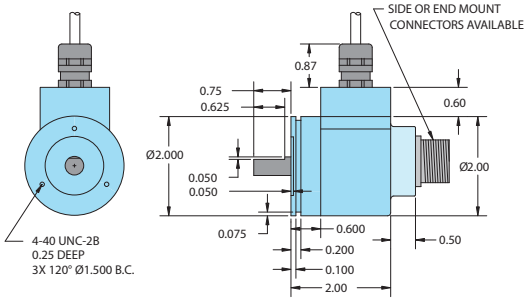
Humidity..... 98% RH non-condensing

Vibration..... 20 g @ 58 to 500 Hz

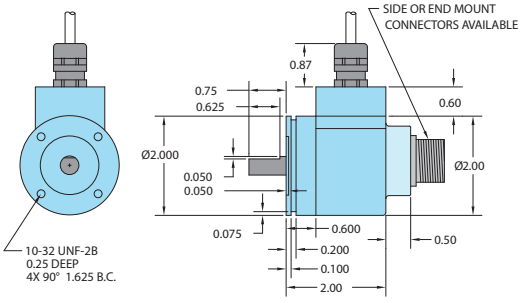
Shock..... 75 g @ 11 ms duration

Sealing..... IP50 standard; IP64, IP66 or IP67 optional

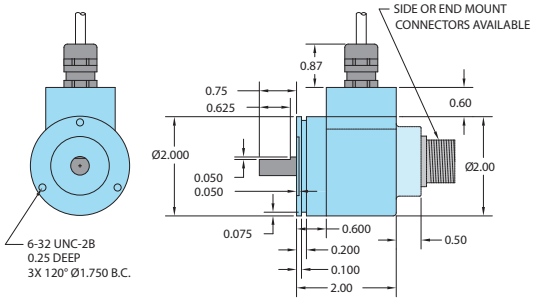
MODEL 702 2.0" SERVO MOUNT (S)



MODEL 702 2.0" SERVO MOUNT (C)

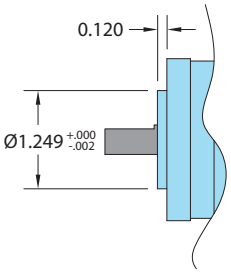


MODEL 702 2.0" SERVO MOUNT (P)

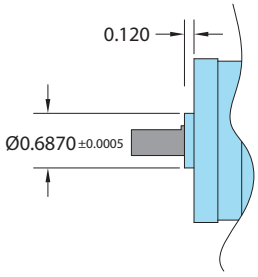


OPTIONAL PILOTS FOR FLANGE AND SERVO MOUNTS

(G, T, D, R)



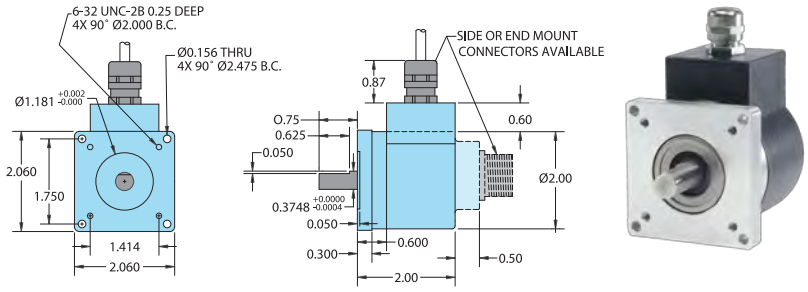
(L, U, E, Q)



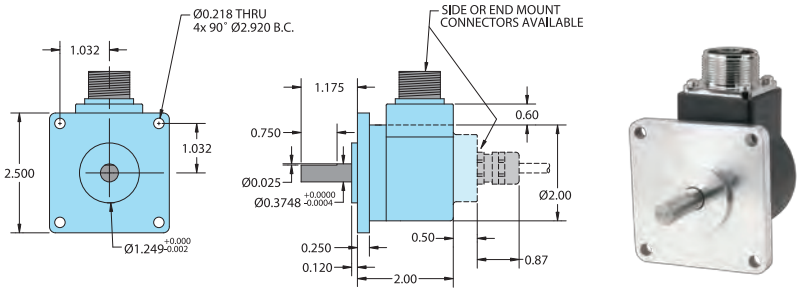
All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

MODEL 702

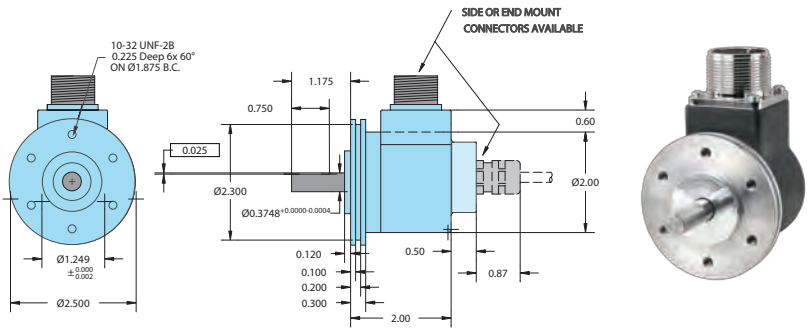
MODEL 702 2.0" FLANGE MOUNT (F)



MODEL 702 WITH 2.5" FLANGE MOUNT (K)



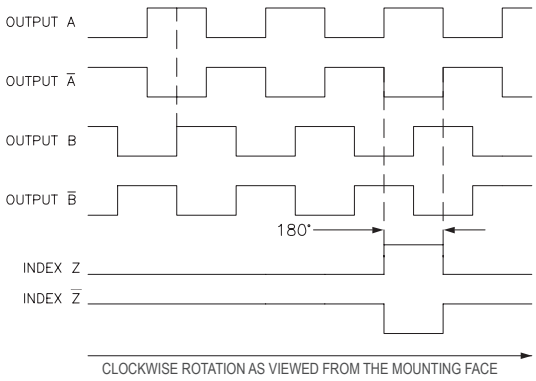
MODEL 702 WITH 2.5" SERVO MOUNT (J)



All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

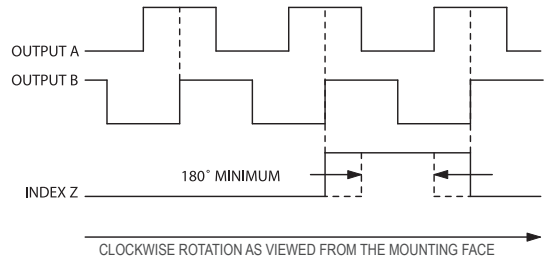
WAVEFORM DIAGRAMS

Line Driver and Push-Pull



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES.
WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS
Ā, B̄, Z̄ FOR HV AND H5 OUTPUTS ONLY.

Open Collector and Pull-Up



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES.
INDEX IS POSITIVE GOING.

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.
Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	5-pin M12**	8-pin M12**	10-Pin MS	7-pin MS HV,H5	7-pin MS PU,PP, OC,P5	6-pin MS PU,PP OC,P5	9-pin D-sub	10-pin Bayonet
Com	Black	3	7	F	F	F	A,F	9	F
+VDC	Red	1	2	D	D	D	B	1	D
A	White	4	1	A	A	A	D	2	A
A'	Brown	--	3	H	C	--	--	3	H
B	Blue	2	4	B	B	B	E	4	B
B'	Violet	--	5	I	E	--	--	5	J
Z	Orange	5	6	C	--	C	C	6	C
Z'	Yellow	--	8	J	--	--	--	7	K
Case	Green	--	--	G	G	G	--	8	G
Shield	Bare*	--	--	--	--	--	--	--	--

*CE Option: Cable shield (bare wire) is connected to internal case.
†Standard cable is 24 AWG conductors with foil and braid shield.
**CE option: Use cable cordset with shield connected to M12 connector coupling nut.

MODEL 702

Ultra Rugged 2.0" Encoder

Quick Specs

- Rugged Industrial Encoder
- 2" x 2" Housing
- CPR to 30,000
- Flex Mount for Easy Installation
- Several Output Types
- RPM to 8000
- Sealing to IP66
- High Temperature Option

Mounting Options

The 702 Motor Mount comes with a coupling and is available with a Bossed Hub to attach directly to fast revving motors.

The 702 Shaft has many different servo mounts and mounting flanges available and is able to handle heavy loads.

Related Products

The Model 802S Accu-Coder™ is an industry standard Size 20 (2.0" diameter) encoder housed in a heavy duty 316 stainless steel package. It's specifically designed for harsh factory and plant floor environments. A variety of flange and servo mounting styles make it easy to use in a broad range of applications. See page 100 for more information.

The Model 25SF Size 25 Accu-CoderPro™ shaft encoder is specifically designed for the challenges of an industrial environment. With its tough, industrial package, it still has the performance to reach resolutions up to 65,536 cycles per revolution, offers 32 waveform options, and has different output types available. See page 92 for more information.

The Model 858S European Size 58 Accu-Coder™ is a heavy duty, extremely rugged, reliable encoder in a 316 stainless steel package. Its compact design is well suited for harsh factory and plant floor environments calling for a metric solution. See page 102 for more information.

The Model 25SP Accu-CoderPro™ is an industry standard Size 25 (2.5" diameter) and is programmable with the easy to use, point and click software. You can program:

- CPR – resolutions to 65,536
- Waveform – 32 options
- Output Type – 6 different output types available

See page 88 for more information.

MODEL 25SP – PROGRAMMABLE

Ø2.5"

FEATURES

Industry Standard Size 25 Package (2.5" x 2.5" / 63.5 mm)
Fully Programmable with Optional USB Module or Factory Configured
Optical Technology for High Accuracy
Resolutions from 1 to 65,536 CPR (262,144 quadrature counts)
Servo and Flange Mounting
IP67 Sealing Available

The Model 25SP Programmable Size 25 Accu-CoderPro™ shaft encoder is specifically designed for the challenges of an industrial environment. But don't let the tough exterior fool you – contained within the rugged, industrial housing is an advanced set of electronics that allow the encoder to be programmed to your exact application needs. Using EPC's optional programming module, users may select the output type, 32 different waveforms, and any resolution from 1 to 65,536 CPR – that's 262,144 counts using 4x quadrature counting. These programming features allow a single encoder to be configured for multiple applications, enabling one encoder to replace many different part numbers – and that provides cost savings on inventory and down-time replacement. The 25SP can also be configured and shipped with specs pre-programmed, with no on-site programming needed. The Model 25SP Accu-CoderPro™ comes standard with dual bearings rated 80lbs axial or radial, and may be specified with up to IP67 sealing.

COMMON APPLICATIONS

Motion Control Feedback, Conveyors, Elevator Controls, Machine Control, Food Processing, Process Control, Robotics, Material Handling, Textile Machines

MODEL 25SP ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Mechanical | Electrical | Optional Features (Leave Blank for Standard Options: -20° to 85° C Std | IP50 Std | None Std)

25SP	–	38	MA	–	B	1000	B5	OC	–	S	MW	–			

MODEL
25SP Size 25 (2.5")

SHAFT SIZE
38 3/8", 0.375" (standard)
19 1/4", 0.250"
03 5/16", 0.3125"
06 6 mm
08 8 mm
10 10 mm

MOUNTING
MA 2.50" Flange
MC 2.50" Servo
MG 2.62" Servo

CPR PROGRAMMING RANGE
A 1 to 16,384
B 1 to 65,536

CPR[1]
Programmable feature. Select the initial CPR to be programmed at factory.

WAVEFORM[1]
Programmable feature. Select the initial index and waveform configuration to be programmed at factory. See options on page 90.

OUTPUT TYPE[1]
Programmable feature. Select the initial output type to be programmed at factory.

Programmable Outputs
OC Open Collector[2]
PP Push-Pull
HV Line Driver

Limited Programmable[3] 5-30 VDC in & 5 VDC out
H5 Line Driver
P5 Push-Pull

Non-Programmable Output
PU Pull-Up Resistor[2]

CONNECTOR LOCATION
E End
S Side

CONNECTOR TYPE
MW 6-pin MS[4]
MY 7-pin MS[5]
MX 10-pin MS
MJ 5-pin M12 (12 mm)[4]
MK 8-pin M12 (12 mm)
F00 Gland, 24" Cable[6]
M00 Gland, 2M Cable[6]
9D 9-pin D-Sub

OPERATING TEMPERATURE
-20° to 85° C (Std)
T6 -40° to 100° C

SEALING
IP50 (Standard)
S1 IP64
S3 IP66
S4 IP67

CERTIFICATION
None (Std)
CE CE Marked[7]

ACCU CODERPRO™ by Encoder Products Company

NOTES:
1 Programmable feature using Field Programming Software, USB Programming Module, and Interface Cable.
2 Open Collector (OC) and Pull-Up Resistor (PU) outputs not recommended for CPR > 8192 and/or frequencies > 150 KHz.
3 If ordered with initial output type of either H5 or P5, encoder cannot be programmed to OC, PP, or HV output types.
4 6-pin MS and 5-pin M12 Connectors only available with Pull-Up, Open Collector, and Push-Pull output types.
5 7-pin MS Connector does not provide Index Pulse Z when selected output is Line Driver (HV or H5).
6 For non-standard English cable lengths enter 'F' plus cable length expressed in feet.
Example: F06 = 6 feet of cable.
For non-standard metric cable lengths enter 'M' plus cable length expressed in meters.
Example: M06 = 6 meters of cable. Frequency above 300 kHz standard cable lengths only.
7 Please refer to Technical Bulletin ***TB100: When to Choose the CE Mark*** at encoder.com.

MODEL 25SP SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 30 VDC max. See Output Types for limitations

Input Current..... 100 mA max with no output load (65 mA typical)

Output Format..... Incremental, Programmable. See Waveforms on page 90 for options.

Output Types..... **Line Driver* (HV)** – 20 mA max per channel, max freq 1.0 MHz, 5 VDC max at 100° C or 24 VDC max at 85° C.
Line Driver* (H5) – 5-30 VDC in/5 VDC out, 20 mA max per channel, max freq 2.7 MHz, 5 VDC max at 100° C.
Push-Pull (PP) – 20 mA max per channel, max frequency 1.0 MHz, 5 VDC max at 100° C or 24 VDC max at 85° C.
Push-Pull (P5) – 5-30 VDC in/5 VDC out, 20 mA max per channel, max frequency 2.7 MHz, 5 VDC max at 100° C.
Open Collector (OC) – 100 mA max per channel, 200 KHz max freq recommended
Pull-Up (PU) – 2.2K ohm internal resistors, 100 mA max per channel, 150 KHz max freq recommended, max temp 85° C at > 24 VDC
**Meets RS 422 at 5 VDC supply*

Index ..... Once per revolution, programmable. EPC standard is 180° gated to output A (waveform B5). See *Waveform Diagrams* for additional options.

Index Teach..... Index location adjustable via programming interface.

Max Frequency ..... 2.7 MHz subject to RPM restrictions for high resolution (CPR):
5000 RPM max for CPR 16385 to 32768 and 2500 RPM max for CPR 32769 to 65536
NOTE: Use 5 VDC Line Driver (H5 or HV output type) to obtain high frequencies.

Electrical Protection .. Overvoltage, reverse voltage, and output short circuit protected. NOTE: Sustained over or reverse voltage may result in permanent damage.

Min Edge Sep ..... 1 to 16384 CPR: 36° electrical min, 63° or better typical
16385 to 65536 CPR: 20° electrical min, 36° or better typical

Rise Time ..... Less than 1 microsecond

Accuracy..... Better than 0.013° or 47 arc-sec from true position

Diagnostic ..... LED located on encoder housing and error report available via programming Interface.

Mechanical

Max Shaft Speed..... 8000 RPM. Higher shaft speeds may be achievable, contact Customer Service.

Shaft Material ..... 303 Stainless Steel

Shaft Rotation ..... Bi-directional

Radial Shaft Load. .... 80 lb max. Rated load of 20 to 40 lb for rated life of $1.5x10^9$ revs

Axial Shaft Load ..... 80 lb max. Rated load of 20 to 40 lb for rated life of $1.5x10^9$ revs

Starting Torque ..... 1.0 oz-in typical with IP64 seal or no seal
3.0 oz-in typical with IP66 shaft seal
7.0 oz-in typical with IP67 shaft seal

Moment of Inertia ... 5.6×10^{-4} oz-in-sec^2

Housing ..... Black non-corrosive finish

Bearings..... Precision ABEC ball bearings

Weight..... 20 oz typical

Environmental

Operating Temp ..... -20° to 85° C for standard models
-40° to 100° C for extended temp option

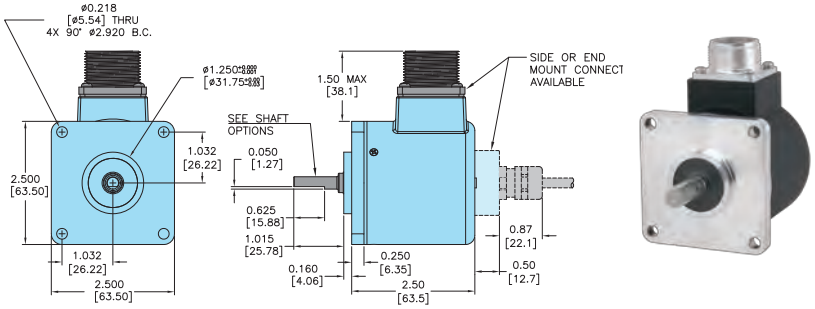
Humidity..... 95% RH non-condensing

Vibration..... 20 g @ 5 to 2000 Hz

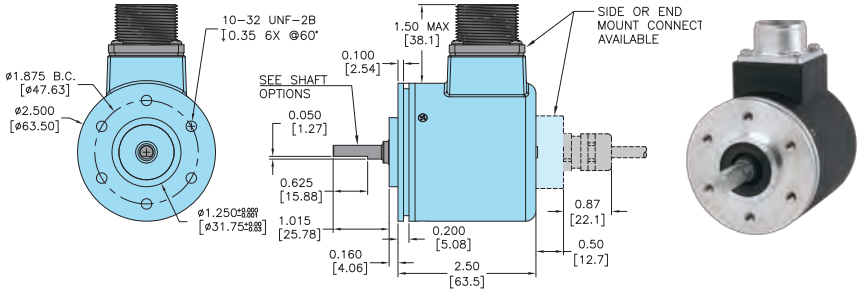
Shock..... 80 g @ 11 ms duration

Sealing..... IP50 standard; IP64, IP66 or IP67 optional

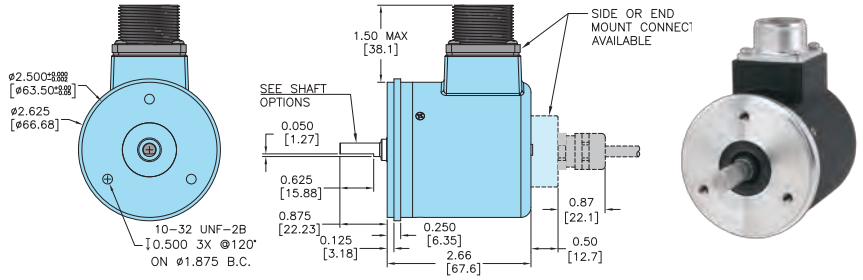
MODEL 25SP FLANGE MOUNT (MA)



MODEL 25SP 2.5" SERVO MOUNT (MC)



MODEL 25SP 2.62" SERVO MOUNT (MG)



All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

ENCODER WIRING TABLE

For EPC-supplied mating cables, wiring table is provided with cable.
Trim back and insulate unused wires.

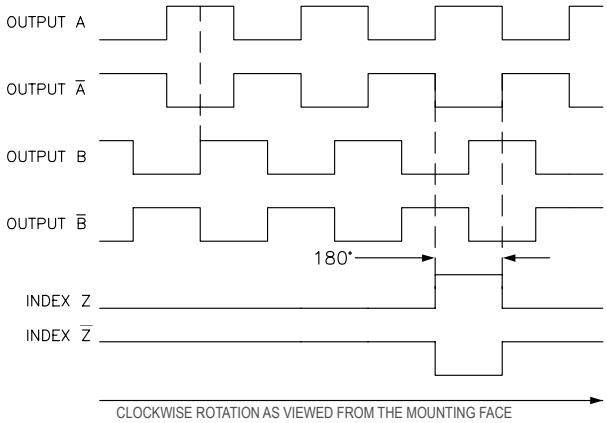
Function	Gland Cable† Wire Color	5-pin M12**	8-pin M12**	10-pin MS	7-pin MS HV,H5	7-pin MS PU,PP, OC,P5	6-pin MS PU,PP, OC,P5	9-pin D-sub
Com	Black	3	7	F	F	F	A	9
+VDC	Red	1	2	D	D	D	B	1
A	White	4	1	A	A	A	D	2
A'	Brown	--	3	H	C	--	--	3
B	Blue	2	4	B	B	B	E	4
B'	Violet	--	5	I	E	--	--	5
Z	Orange	5	6	C	--	C	C	6
Z'	Yellow	--	8	J	--	--	--	7
Case	Green	--	--	G	G	G	F	8
Shield	Bare*	--	--	--	--	--	--	--

*CE Option: Cable shield (bare wire) is connected to internal case.
†Standard cable is 24 AWG conductors with foil and braid shield.
**CE Option: Use cable cordset with shield connected to M12 connector coupling nut.

An EPC Size 25 Encoder in a common application

EPC STANDARD WAVEFORM (B5)

Additional waveforms available. See below for other options.

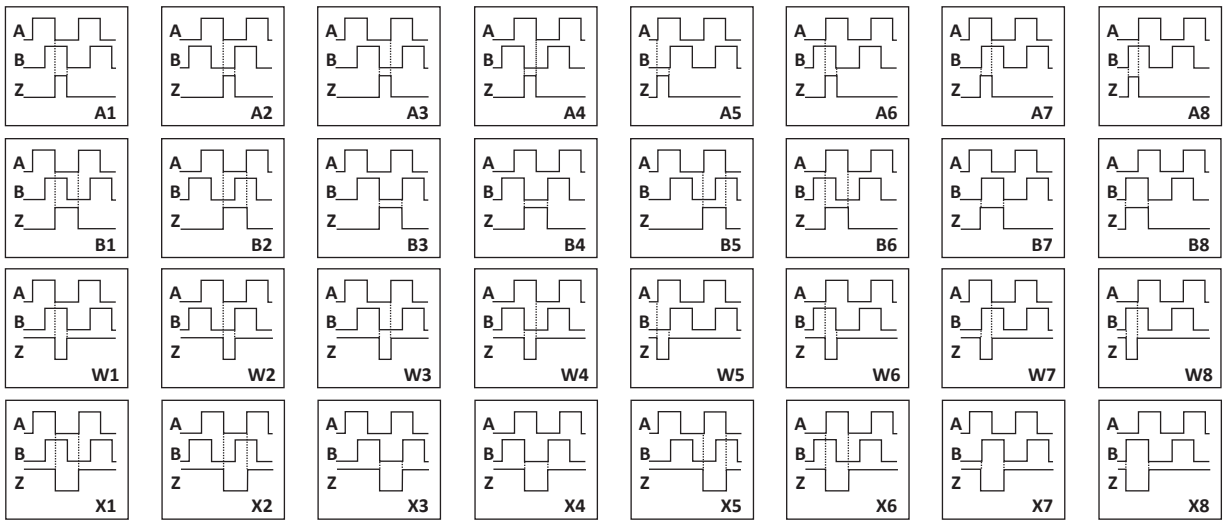


NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES.
COMPLEMENTARY SIGNALS $\overline{A}$, $\overline{B}$, $\overline{Z}$ APPLY TO LINE DRIVER (HV & H5) OUTPUTS ONLY.

WAVEFORMS

Model 25SP: Choose any of these waveforms when ordering. May be changed using the Field Programming Software, USB programming module, and interface cable (see page 91).

Model 25SF: Choose any of these waveforms when ordering.



Odd numbers - A leads B
Even numbers - B leads A

A and B - High Going Index
W and X - Low Going Index

A and W - 90 Degree Index
B and X - 180 Degree Index

FIELD PROGRAMMING SOFTWARE

With the easy to use, point-and-click interface, programming is quick and straight-forward. The number of possible configurations makes this Size 25 programmable shaft encoder incredibly versatile. Anywhere a Size 25 encoder goes, the Model 25SP can get the job done.

Available on USB drive or by download.

System requirements:

- Windows 7 or higher operating systems
- USB 2.0 port required for USB Programming Module (see below)

✓ CPR – any resolution from 1 to 65,536

That's 262,144 counts using 4x quadrature counting

✓ Waveform – choose from 32 options

See page 90 for waveform choices

✓ Output type – 6 different output types

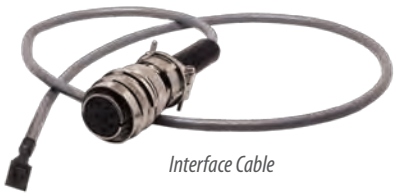
All output types are 5V to 30V in/out except H5 Line Driver and P5 Push-Pull output types, which are 5-30VDC in and 5VDC out.

USB PROGRAMMING KIT

Kit includes Field Programming Software, USB Programming Module, and 2-meter Interface Cable with specified connector. See Accessories for individual Interface Cables.

Model 25SP assembled with programming accessories

USB Programming Module



Interface Cable

CONNECTOR TYPE	ITEM #
6-pin MS	PR1-001-06
7-pin MS	PR1-001-07
10-pin MS	PR1-001-10
5-pin M12	PR1-001-J
8-pin M12	PR1-001-K
9-pin D-Sub	PR1-001-09
Gland Cable	PR1-001-G

MODEL 25SF

Ø2.5"

FEATURES

Industry Standard Size 25 Package (2.5" x 2.5" / 63.5 mm)
Resolutions from 1 to 65,536 CPR (262,144 quadrature counts)
Servo and Flange Mounting
Optical Technology for High Accuracy
Standard with Heavy-Duty Dual Bearings Rated Load of 80 lbs axial & radial
IP67 Sealing Available

The Model 25SF Size 25 Accu-CoderPro™ shaft encoder offers the performance advantages of the programmable Model 25SP, but in an economical, fixed resolution version. The versatile Model 25SF offers 32 different waveforms options, six output types, and any resolution from 1 to 65,536 CPR. Specifically designed for the challenges of an industrial environment, the Model 25SF features a rugged, industrial housing and comes standard with dual bearings rated 80 lbs axial or radial. Offering shaft sizes up to 10 mm, multiple mounting options, and sealing up to IP67, this encoder can take on your most demanding application.

COMMON APPLICATIONS

Motion Control Feedback, Conveyors, Elevator Controls, Machine Control, Food Processing, Process Control, Robotics, Material Handling, Textile Machines

MODEL 25SF ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Mechanical | Electrical | Optional Features (Leave Blank for Standard Options)

25SF	–	38	MA	–	X	1000	B5	OC	–	S	MW	–			
													-20º to 85º C Std	IP50 Std	None Std

MODEL
25SF Size 25 (2.5")

SHAFT SIZE
38 3/8", 0.375" (standard)
19 1/4", 0.250"
03 5/16", 0.3125"
06 6 mm
08 8 mm
10 10 mm

MOUNTING
MA 2.50" Flange
MC 2.50" Servo
MG 2.62" Servo

CPR
1 - 65,536
Price Adder for > 16,384

WAVEFORM
Select the index and waveform configuration. See page 90 for options.

OUTPUT TYPE[1]
OC Open Collector[2]
PP Push-Pull
HV Line Driver
PU Pull-Up Resistor[2]
H5 Line Driver
P5 Push-Pull

CONNECTOR LOCATION
E End
S Side

CONNECTOR TYPE
MW 6-pin MS[3]
MY 7-pin MS[4]
MX 10-pin MS
MJ 5-pin M12 (12 mm)[3]
MK 8-pin M12 (12 mm)
F00 Gland, 24" Cable[5]
M00 Gland, 2M Cable[5]
9D 9-pin D-Sub

OPERATING TEMPERATURE
-20º to 85º C (Std)
T6 -40º to 100º C

SEALING
IP50 (Standard)
S1 IP64
S3 IP66
S4 IP67

CERTIFICATION
None (Std)
CE CE Marked[6]

ACCU-CODERPRO™ by Encoder Products Company

NOTES:

1. All output types are 5V to 30V in/out ***except*** H5 Line Driver and P5 Push-Pull output types, which are 5-30VDC in and 5VDC out.
2. Open Collector and Pull-Up Resistor outputs not recommended for CPR > 8192 and/or frequencies > 150 KHz.
3. 6-pin MS and 5-pin M12 Connectors only available with Pull-Up, Open Collector, and Push-Pull output types.
4. 7-pin MS Connector does not provide Index Pulse Z when selected output is Line Driver (HV or H5).
5. For non-standard English cable lengths enter 'F' plus cable length expressed in feet. Example: F06 = 6 feet of cable. For non-standard metric cable lengths enter 'M' plus cable length expressed in meters. Example: M06 = 6 meters of cable. Frequency above 300 kHz standard cable lengths only.
6. Please refer to Technical Bulletin ***TB100: When to Choose the CE Mark*** at encoder.com.

MODEL 25SF SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 30 VDC max. See Output Types for limitations

Input Current..... 100 mA max with no output load (65mA typical)

Output Format..... Incremental. See Waveforms on page 90 for options.

Output Types..... **Line Driver* (HV)** – 20 mA max per channel, max freq 1.0 MHz, 5 VDC max at 100° C or 24 VDC max at 85° C.
Line Driver* (H5) – 5-30 VDC in/5 VDC out, 20 mA max per channel, max freq 2.7 MHz, 5 VDC max at 100° C.
Push-Pull (PP) – 20 mA max per channel, max frequency 1.0 MHz, 5 VDC max at 100° C or 24 VDC max at 85° C.
Push-Pull (P5) – 5-30 VDC in/5 VDC out, 20 mA max per channel, max frequency 2.7 MHz, 5 VDC max at 100° C.
Open Collector (OC) – 100 mA max per channel, 200 KHz max freq recommended
Pull-Up (PU) – 2.2K ohm internal resistors, 100 mA max per channel, 150 KHz max freq recommended, max temp 85° C at > 24 VDC
**Meets RS 422 at 5 VDC supply*

Index ..... Once per revolution. EPC standard is 180° gated to output A (waveform B5). See Waveforms on Model 25SP for options.

Max Frequency ..... 2.7 MHz subject to RPM restrictions for high resolution (CPR):
5000 RPM max for CPR 16385 to 32768 and
2500 RPM max for CPR 32769 to 65536
NOTE: Use 5 VDC Line Driver (H5 or HV output type) to obtain high frequencies.

Electrical Protection .. Overvoltage, reverse voltage, and output short circuit protected. NOTE: Sustained over or reverse voltage may result in permanent damage.

Min Edge Sep ..... 1 to 16384 CPR: 36° electrical min, 63° or better typical
16385 to 65536 CPR: 20° electrical min, 36° or better typical

Rise Time ..... Less than 1 microsecond

Accuracy..... Better than 0.013° or 47 arc-sec from true position

Mechanical

Max Shaft Speed..... 8000 RPM. Higher shaft speeds may be achievable, contact Customer Service.

Shaft Material ..... 303 Stainless Steel

Shaft Rotation ..... Bi-directional

Radial Shaft Load. .... 80 lb max. Rated load of 20 to 40 lb for rated life of $1.5x10^9$ revs

Axial Shaft Load ..... 80 lb max. Rated load of 20 to 40 lb for rated life of $1.5x10^9$ revs

Starting Torque ..... 1.0 oz-in typical with IP64 seal or no seal
3.0 oz-in typical with IP66 shaft seal
7.0 oz-in typical with IP67 shaft seal

Moment of Inertia ... 5.6×10^{-4} oz-in-sec^2

Housing ..... Black non-corrosive finish

Bearings..... Precision ABEC ball bearings

Weight..... 20 oz typical

Environmental

Operating Temp ..... -20° to 85° C for standard models
-40° to 100° C for extended temp option

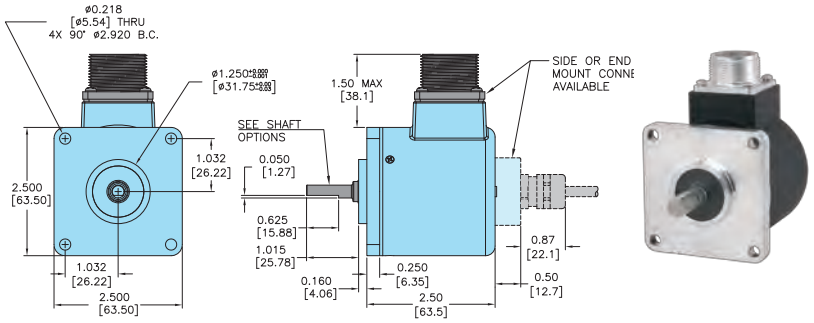
Humidity..... 95% RH non-condensing

Vibration..... 20 g @ 5 to 2000 Hz

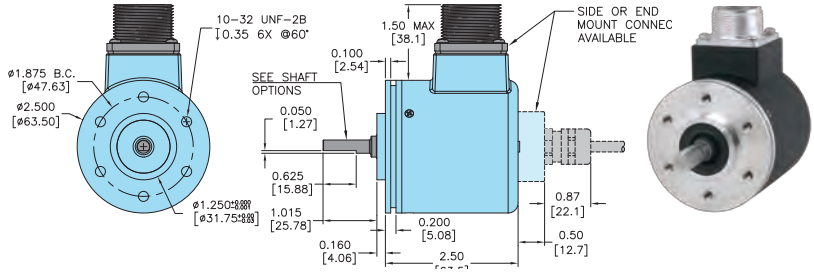
Shock..... 80 g @ 11 ms duration

Sealing..... IP50 standard; IP64, IP66 or IP67 optional

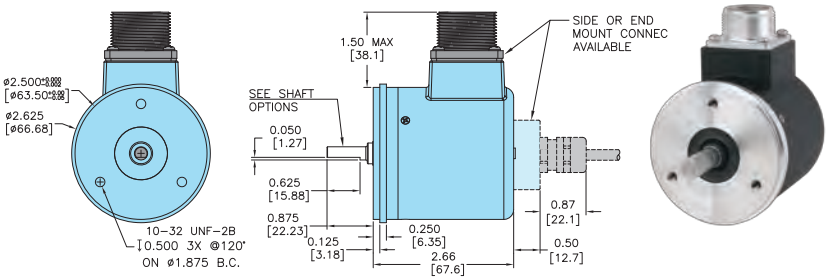
MODEL 25SF FLANGE MOUNT (MA)



MODEL 25SF 2.5" SERVO MOUNT (MC)



MODEL 25SF 2.62" SERVO MOUNT (MG)



All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

ENCODER WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.
Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	5-pin M12**	8-pin M12**	10-pin MS	7-pin MS HV,H5	7-pin MS PU,PP, OC,P5	6-pin MS PU,PP, OC,P5	9-pin D-sub
Com	Black	3	7	F	F	F	A	9
+VDC	Red	1	2	D	D	D	B	1
A	White	4	1	A	A	A	D	2
A'	Brown	--	3	H	C	--	--	3
B	Blue	2	4	B	B	B	E	4
B'	Violet	--	5	I	E	--	--	5
Z	Orange	5	6	C	--	C	C	6
Z'	Yellow	--	8	J	--	--	--	7
Case	Green	--	--	G	G	G	F	8
Shield	Bare*	--	--	--	--	--	--	--

*CE Option: Cable shield (bare wire) is connected to internal case.
†Standard cable is 24 AWG conductors with foil and braid shield.
**CE Option: Use cable cordset with shield connected to M12 connector coupling nut.

MODEL 725

Ø2.5"

FEATURES
Standard Size 25 Package (2.5" x 2.5")
Up to 30,000 CPR
Standard and Industrial Housings
Servo and Flange Mounting
IP67 Sealing Available

The Model 725 Accu-Coder™ optical shaft encoder is specifically designed for the challenges of an industrial environment. Even with its tough, industrial package, this Size 25 encoder still has the performance to reach resolutions up to 30,000 cycles per revolution. The Model 725 offers both flange and servo mounting options, and is available in two distinctive housing styles: Standard Housing (N) and Industrial Housing (I). The rugged Standard Housing isolates the internal electronics from the shock and stress of the outer environment, while the extra heavy-duty Industrial Housing features a fully isolated internal encoder unit. Isolating the unit prolongs bearing life by using an internal flexible mount to protect the encoder from severe axial and radial shaft loading. The Industrial Housing is the recommended solution for applications subject to continuous side loads, such as those that drive the encoder with a measuring wheel, pulley, or chain and sprocket.

COMMON APPLICATIONS
Motion Control Feedback, Conveyors, Elevator Controls, Machine Control, Food Processing, Process Control, Robotics, Material Handling, Textile Machines

MODEL 725 ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

725 N – 4 – S – 1000 – R – HV – 1 – F – 1 – E X – N – CE

MODEL
725 Size 25 (2.5")

HOUSING STYLE
N Standard Housing
I Heavy Duty Industrial with Internal Flex Mount

SHAFT SIZE
S 3/8", 0.375" (standard)
4 1/4", 0.250"
19 5/16", 0.3125"
25 3/8", 0.375" - No flat[1]
06 6 mm
18 8 mm
21 10 mm

OPERATING TEMPERATURE
S 0° to 70° C
L -40° to 70°C[2]
H 0° to 100° C[3]

CYCLES PER REVOLUTION
1-30,000
See *CPR Options* for available resolutions.
Price adder for CPR >1270

NUMBER OF CHANNELS[4]
A Channel A
Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index
Channel B Leads A
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index

OUTPUT TYPE
5 - 28V In/Out[5]
OC Open Collector
PU Pull-Up Resistor
PP Push-Pull
HV Line Driver[6]
8 - 28V In/5V Out[7,8]
H5 Line Driver[6]
P5 Push-Pull

MAXIMUM FREQUENCY
1 Standard 100 kHz
2 200 kHz ≤ 3000 CPR
5 250 kHz, >3000 CPR
3 500 kHz, >6000 CPR[9]
4 1 MHz, >10,000 CPR[9]

MOUNTING
F Flange
S 2.50" Servo
R 2.50" Servo
Q 2.50" Servo
L 2.62" Servo
P 5PY

SEALING
N No Seal
1 IP66
2 IP64
5 IP67

CONNECTOR LOCATION
S Side
E End

CONNECTOR TYPE[10]
W 6-pin MS[6]
Y 7-pin MS[6]
X 10-pin MS
9D 9-pin D-subminiature
J 5-pin M12 (12 mm)[6]
K 8-pin M12 (12 mm)
G Gland, 24" Cable[11]

MATING CONNECTOR
N No
Y Yes

CERTIFICATION
N None
CE CE Marked[12]

MODEL 725 CPR OPTIONS

0001*	0002*	0004*	0005*	0006*	0007*	0008*	0010*	0011*	0012*
0014*	0020	0021*	0024*	0025*	0028*	0030*	0032*	0033*	0034*
0035*	0038*	0040*	0042*	0045*	0050*	0060	0064*	0100	0120
0125	0128*	0144*	0150*	0160*	0192*	0200	0240*	0250	0254*
0256*	0300	0333*	0336*	0360	0400	0500	0512	0600	0625*
0635	0665*	0720	0768*	0800	0889	1000	1024	1200	1201*[a]
1203*[a]	1204*[a]	1250[a]	1270[a]	1440	1500	1800	2000	2048	2400[a]
2500	2540[a]	2880[a]	3000[a]	3600[a]	4000[a]	4096[a]	5000[a]	6000[a]	7200[a]
7500[a]	9000[a]	10,000[a]	10,240[a]	12,000[a]	12,500[a]	14,400[a]	15,000[a]	18,000[a]	20,000[a]
20,480[a]	25,000[a]	30,000[a]							

*Contact Customer Service for High Temperature Option (H).
[a]High Temperature Option (H) limited to 85° C maximum for these CPR options.

New CPR values are periodically added to those listed. Contact Customer Service to determine all currently available CPR values. Special disk resolutions are available upon request. A one-time NRE fee may apply.

NOTES:
1 Available with Industrial Housing (I) only.
2 Low temperature option not available with resolutions of 3000 CPR or higher.
3 0° to 85° C for certain resolutions, see CPR Options.
4 Contact Customer Service for index gating options.
5 24 VDC max for high temperature option.
6 Line Driver not available with 5-pin M12 or 6-pin MS connector. Available with 7-pin MS connector only without Index Z.
7 Standard temperature, 60 to 3000 CPR only. Not available with 2540 CPR.
8 H5 and P5 outputs not available with CE option, or any End Mount MS connector.
9 Standard cable lengths only. For details, please refer to Technical Bulletin ***TB116: Noise and Signal Distortion Considerations*** at encoder.com.
10 For mating connectors, cables, and cordsets see **Accessories** at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see **Connector Pin Configuration Diagrams** at encoder.com.
11 For Non-Standard Cable Lengths add a forward slash (/) plus cable length expressed in feet. Example: SG/6 = 6 feet of cable.
12 Please refer to Technical Bulletin ***TB100: When to Choose the CE Mark*** at encoder.com.

MODEL 725 SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 70° C
4.75 to 24 VDC for temperatures between 70° C and 100° C

Input Current..... 100 mA max with no output load

Input Ripple..... 100 mV peak-to-peak at 0 to 100 kHz

Output Format..... Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mounting face. See *Waveform Diagrams*.

Output Types..... Open Collector – 100 mA max per channel
Pull-Up – Open Collector with 2.2K ohm internal resistor, 100 mA max per channel
Push-Pull – 20 mA max per channel
Line Driver – 20 mA max per channel
(Meets RS 422 at 5 VDC supply)

Index ..... Occurs once per revolution. The index for units >3000 CPR is 90° gated to Outputs A and B. See *Waveform Diagrams*.

Max Frequency ..... Up to 1 MHz

Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.

Noise Immunity..... Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN50081-2

Symmetry ..... 1 to 6000 CPR: 180° (±18°) electrical at 100 kHz output
6001 to 20,480 CPR: 180° (±36°) electrical

Quad Phasing..... 1 to 6000 CPR: 90° (±22.5°) electrical at 100 kHz output
6001 to 20,480 CPR: 90° (±36°) electrical

Min Edge Sep..... 1 to 6000 CPR: 67.5° electrical at 100 kHz output
6001 to 20,480 CPR: 54° electrical
>20,480 CPR: 50° electrical

Rise Time ..... Less than 1 microsecond

Accuracy..... Instrument and Quadrature Error: For 200 to 1999 CPR, 0.017° mechanical (1.0 arc minutes) from one cycle to any other cycle. For 2000 to 3000 CPR, 0.01° mechanical (0.6 arc minutes) from one cycle to any other cycle. Interpolation error (units > 3000 CPR only) within 0.005° mechanical. (Total Optical Encoder Error = Instrument + Quadrature + Interpolation)

Mechanical

Max Shaft Speed..... 8000 RPM. Higher shaft speeds may be achievable, contact Customer Service.

Shaft Material ..... 303 Stainless Steel

Shaft Rotation ..... Bi-directional

Radial Shaft Load. .... 80 lb max. Rated load of 20 to 40 lb for bearing life of 1.5 x 10^9 revolutions

Axial Shaft Load ..... 80 lb max. Rated load of 20 to 40 lb for bearing life of 1.5 x 10^9 revolutions

Starting Torque ..... 1.0 oz-in typical with IP64 seal or no seal
3.0 oz-in typical with IP66 shaft seal
7.0 oz-in typical with IP67 shaft seal

Moment of Inertia ... 5.2 x 10^{-4} oz-in-sec^2

Housing ..... Black non-corrosive finish

Bearings..... Precision ABEC ball bearings

Weight..... 20 oz typical

Environmental

Storage Temp ..... -25° to 85° C

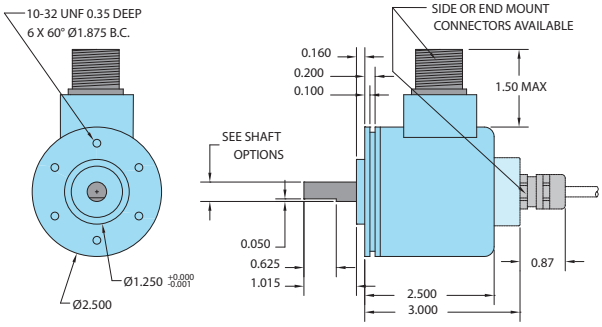
Humidity..... 95% RH non-condensing

Vibration..... 20 g @ 58 to 500 Hz

Shock..... 75 g @ 11 ms duration

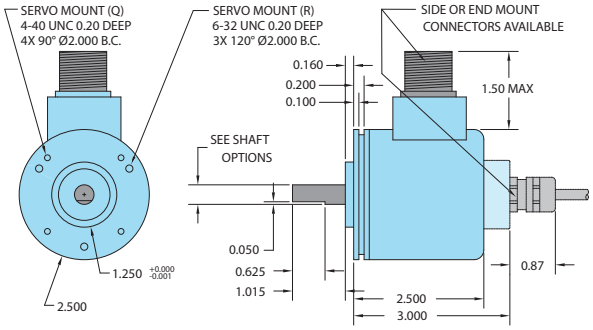
Sealing..... IP50 standard; IP64, IP66 or IP67 optional

MODEL 725 2.5" SERVO MOUNT (S)

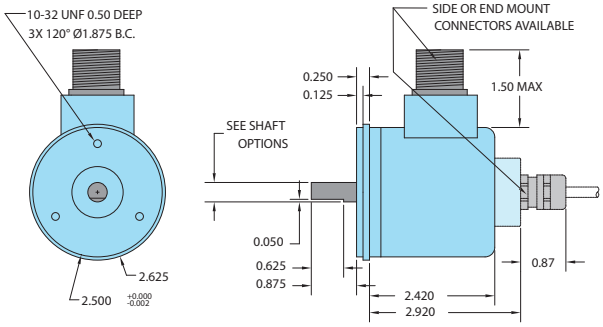


MODEL 725 2.5" SERVO MOUNT (Q)

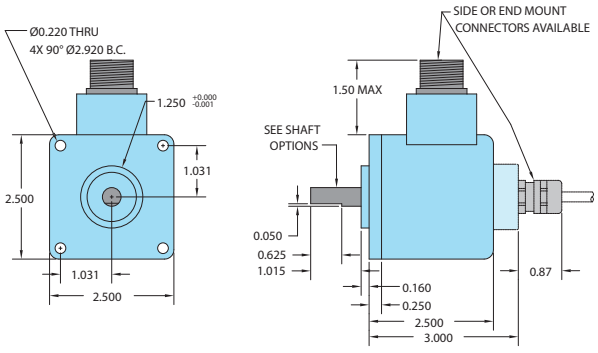
Servo mount (R) has been discontinued and replaced by servo mount (Q)



MODEL 725 2.62" SERVO MOUNT (L)



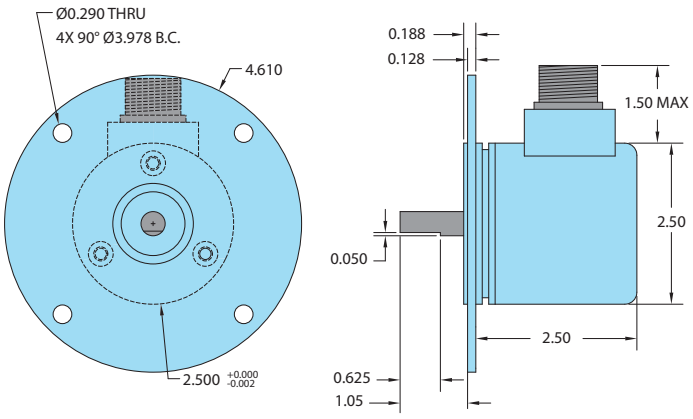
MODEL 725 FLANGE MOUNT (F)



All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

MODEL 725

MODEL 725 OPTIONAL 5PY MOUNTING (P)

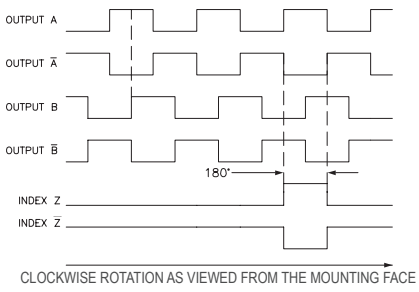


All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

The optional 5PY adapter is made of all aluminum construction and allows the Model 725 encoder to replace DC tachometer technology. The 5PY adapter is mechanically interchangeable with any 5PY tach generator.

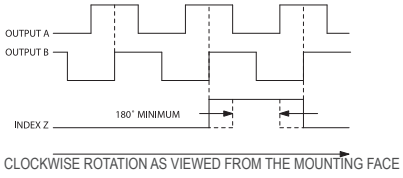
WAVEFORM DIAGRAMS

Line Driver and Push-Pull



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV OUTPUT ONLY.

Open Collector and Pull-Up



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. INDEX IS POSITIVE GOING.

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.
Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	5-pin M12**	8-pin M12**	10-pin MS	7-pin MS HV,H5	7-pin MS PU,PP,OC,P5	6-pin MS PU,PP,OC,P5	9-pin D-sub
Com	Black	3	7	F	F	F	A,F	9
+VDC	Red	1	2	D	D	D	B	1
A	White	4	1	A	A	A	D	2
A'	Brown	--	3	H	C	--	--	3
B	Blue	2	4	B	B	B	E	4
B'	Violet	--	5	I	E	--	--	5
Z	Orange	5	6	C	--	C	C	6
Z'	Yellow	--	8	J	--	--	--	7
Case	Green	--	--	G	G	G	--	8
Shield	Bare*	--	--	--	--	--	--	--

*CE Option: Cable shield (bare wire) is connected to internal case.
†Standard cable is 24 AWG conductors with foil and braid shield.
**CE Option: Use cable cord set with shield connected to M12 connector coupling nut.

EPC SIZE 25 ENCODERS

A Step Above the Rest

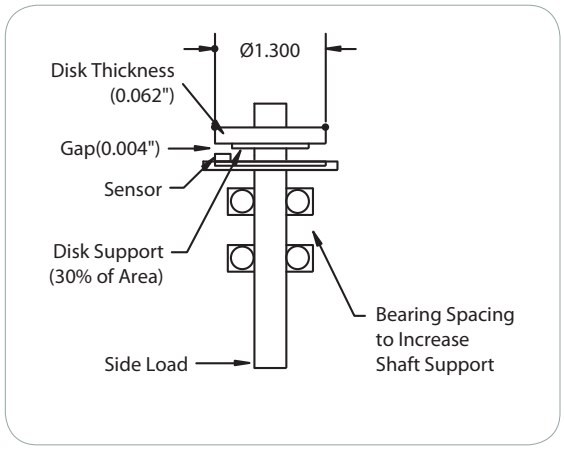
Size 25 encoders (2.5" diameter) are among the most popular encoders in the world. As a result, nearly every encoder manufacturer in the world makes them. The problem is, not every Size 25 encoder is built to the same exacting standards of quality and reliability as the Encoder Products Company's line of Size 25 encoders.

So, what's the problem? If you have used other Size 25 encoders, you have probably experienced reliability problems, such as sensor crashes and disk breakage. The typical construction of a Size 25 encoder uses a single set of closely spaced shaft bearings and a large-diameter (typically 2.0") glass disk mounted to the shaft. The glass disk is generally supported on the shaft hub by just 15% of the surface area and has a thickness of 0.030".

In addition, these units commonly require a relatively narrow air gap (typically 0.002") between the disk and sensor in order to properly calibrate the signal. Because of this combination, a small amount of side loading (force from installation requirements, vibration, shock, or other conditions) to move the shaft enough for the attached disk to make contact with the sensor or some other portion of the stationary PCB. The result is damage to the disk or sensor, or even disk breakage.

So what's the solution? When design engineers at EPC set out to design a better Size 25 encoder, their goal was to solve the typical problems.

The first goal was to make it more difficult for shaft movement from side load to cause damage. Using EPC's advanced sensor technology, the air gap between the disk and sensor doubled from 0.002" to 0.004", and the disk diameter was reduced from 2.0" to 1.3".



The next goal was to increase the durability of the disk itself. Disk thickness was more than doubled (from 0.030" to 0.062"), manufactured using EPC's proprietary process, and supported by 30% of the disk surface area.

Finally, it was time to improve the resistance to side load movement altogether, so the Size 25s were given dual heavy-duty bearings, generously spaced to disperse the load over a larger portion of the shaft.

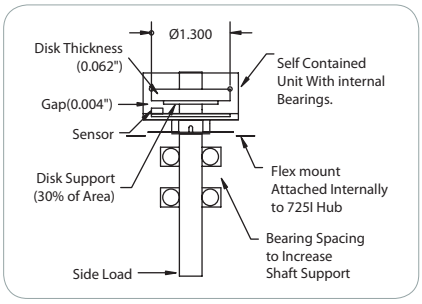
EPC Models 725, 25SF, and 25SP all share these features, and are all rugged encoders that can work in the most challenging environments. Review the chart below to note the differences among these models and help you determine which one is right for your application.

Model #	Max CPR	Max Frequency	Number of Waveform Options	Bearing Load	Maximum Seal Rating
725	30,000	1 MHz	5	Dual bearings rated 80lbs axial or radial	IP67
25SF	65,536	2.7 MHz	32	Dual bearings rated 80lbs axial or radial	IP67
25SP	65,536*	2.7 MHz	32*	Dual bearings rated 80lbs axial or radial	IP67

Options are programmable with Field Programming Software.

For the TRULY tough environment

The Model 725I with the industrial 725 housing option is an encoder that is as robust as possible within its price category. Using the improvements developed for our standard Size 25s, EPC's engineering team developed the "encoder-within-an-encoder" design. In addition, the internal encoder is mounted to the 725I's housing using EPC's pioneering flex mount, further isolating the internal optics and electronics from outside forces.



MODEL 758

Ø58 mm

FEATURES

Standard Size 58 Mounting (58 mm Diameter)
Up to 30,000 CPR
80 lb Max. Axial and Radial Shaft Loading
High Temperature Option (100° C)
IP67 Sealing Available

The Model 758 Size 58 Accu-Coder™ is a heavy duty, extremely rugged, reliable, yet compact European standard size 58 millimeter diameter encoder, designed for harsh factory and plant floor environments. Shaft loading is no problem for the double-shielded ball bearings; their 80 lb load rating ensures a long operating life. With the optional heavy-duty shaft seal, the Model 758 is rated IP67. Two European standard mounting options are available: Clamping Flange (20 Type) or Synchro Flange (26 Type). The Model 758 is the perfect replacement encoder for units requiring the European mount.

COMMON APPLICATIONS

Motion Control Feedback, Machine & Elevator Controls, Food Processing, Robotics, Material Handling, Conveyors, Textile Machines

MODEL 758 ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

758 – A – 21 – S – 1000 – R – HV – 1 – 1 – E – R – CE

MODEL
758 Model 758

MOUNTING TYPE[1]
A Clamping Flange (20 Type)
B Synchro Flange (26 Type)

SHAFT SIZE[1]
06 6 mm
21 10 mm
07 0.250", 1/4"
20 0.375", 3/8"

OPERATING TEMPERATURE
S 0° to 70° C
L -40° to 70° C[2]
H 0° to 100° C[3]

CYCLES PER REVOLUTION
1-30,000
See *CPR Options* below for available resolutions.
Price adder for CPR >1270

NUMBER OF CHANNELS[4]
A Channel A
Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index
Channel B Leads A
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index

OUTPUT TYPE
5 - 28V In/Out[5]
OC Open Collector
PU Pull-Up Resistor
PP Push-Pull
HV Line Driver[6,8]
8 - 28V In/5V Out[6,7]
H5 Line Driver[6,8]
P5 Push-Pull

MAXIMUM FREQUENCY
1 100 kHz Standard
2 200 kHz ≤ 3000 CPR
5 250 kHz, >3000 CPR
3 500 kHz, >6000 CPR[9]
4 1 MHz, >10,000 CPR[9]

SEALING
N No Seal
1 IP66
2 IP64
5 IP67

CONNECTOR LOCATION
S Side
E End

CONNECTOR TYPE[10]
G Gland, 24" Cable[11]
R 12-pin M23
J 5-pin M12 (12 mm)[8]
K 8-pin M12 (12 mm)
X 10-pin MS
Y 7-pin MS[8]

CERTIFICATION
N None
CE CE Marked[12]

MODEL 758 CPR OPTIONS

0001*	0002*	0004*	0005*	0006*	0007*	0008*	0010*	0011*
0012*	0014*	0020	0021*	0024*	0025*	0028*	0030*	0032*
0033*	0034*	0035*	0038*	0040*	0042*	0045*	0050*	0060
0064*	0100	0120	0125	0128*	0144*	0150*	0160*	0192*
0200	0240*	0250	0254*	0256*	0300	0333*	0336*	0360
0400	0500	0512	0600	0625*	0635	0665*	0720	0768*
0800	0889	1000	1024	1200	1201*[a]	1203*[a]	1204*[a]	1250[a]
1270[a]	1440	1500	1800	2000	2048	2400[a]	2500	2540[a]
2880[a]	3000[a]	3600[a]	4000[a]	4096[a]	5000[a]	6000[a]	7200[a]	7500[a]
9000[a]	10,000[a]	10,240[a]	12,000[a]	12,500[a]	14,400[a]	15,000[a]	18,000[a]	20,000[a]
20,480[a]	25,000[a]	30,000[a]						

*Contact Customer Service for High Temperature Option (H).
[a]High Temperature Option (H) limited to 85° C maximum for these CPR options.

New CPR values are periodically added to those listed. Contact Customer Service to determine all currently available CPR values. Special disk resolutions are available upon request. A one-time NRE fee may apply.

NOTES:

1 The shaft on 20 Type mountings includes a 15.58 mm flat. The shaft on 26 Type mountings is provided without a flat.
2 Low temperature option not available with resolutions of 3000 CPR or higher.
3 0° to 85° C for certain resolutions, see CPR Options.
4 Contact Customer Service for index gating options.
5 24 VDC max for high temperature option.
6 H5 and P5 outputs are not available with CE option, or any End Mount MS Connector.
7 Standard temperature, 60 to 3000 CPR only. Not available with 2540 CPR.
8 Line Driver Outputs not available with 5-pin M12 connector. Available with 7-pin MS connector only without Index Z.
9 Standard cable lengths only. For details, please refer to Technical Bulletin *TB116: Noise and Signal Distortion Considerations* at encoder.com.
10 For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
11 For Non-Standard Cable Lengths add a forward slash (/) plus cable length expressed in feet. Example: SG/6 = 6 feet of cable.
12 Please refer to Technical Bulletin *TB100: When to Choose the CE Mark* at encoder.com.

MODEL 758 SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 70° C
4.75 to 24 VDC for temperatures between 70° C to 100° C

Input Current ..... 100 mA max with no output load

Input Ripple..... 100 mV peak-to-peak at 0 to 100 kHz

Output Format..... Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mounting face.
See *Waveform Diagrams*.

Output Types..... Open Collector – 100 mA max per channel
Pull-Up – Open Collector with 2.2K ohm internal resistor, 100 mA max per channel
Push-Pull – 20 mA max per channel
Line Driver – 20 mA max per channel
(Meets RS 422 at 5 VDC supply)

Index..... Occurs once per revolution. The index for units >3000 CPR is 90° gated to Outputs A and B. See *Waveform Diagrams*.

Max Frequency ..... Up to 1 MHz

Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.

Noise Immunity..... Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN50081-2

Symmetry..... 1 to 6000 CPR: 180° (±18°) electrical at 100 kHz output
6001 to 20,480 CPR: 180° (±36°) electrical

Quad Phasing..... 1 to 6000 CPR: 90° (±22.5°) electrical at 100 kHz output
6001 to 20,480 CPR: 90° (±36°)

Min Edge Sep ..... 1 to 6000 CPR: 67.5° electrical at 100 kHz output
6001 to 20,480 CPR: 54° electrical
>20,480 CPR: 50° electrical

Rise Time..... Less than 1 microsecond

Accuracy..... Instrument and Quadrature Error: For 200 to 1999 CPR, 0.017° mechanical (1.0 arc minutes) from one cycle to any other cycle. For 2000 to 3000 CPR, 0.01° mechanical (0.6 arc minutes) from one cycle to any other cycle. Interpolation error (units > 3000 CPR only) within 0.005° mechanical. (Total Optical Encoder Error = Instrument + Quadrature + Interpolation)

Mechanical

Max Shaft Speed..... 8000 RPM. Higher shaft speeds may be achievable, contact Customer Service.

Shaft Rotation ..... Bi-directional

Radial Shaft Load ..... 80 lb max. Rated load of 20 to 40 lb for bearing life of 1.5 x 10^9 revolutions

Axial Shaft Load ..... 80 lb max. Rated load of 20 to 40 lb for bearing life of 1.5 x 10^9 revolutions

Starting Torque ..... 1.0 oz-in typical with IP64 seal or no seal
3.0 oz-in typical with IP66 shaft seal
7.0 oz-in typical with IP67 shaft seal

Moment of Inertia ... 5.2 x 10^{-4} oz-in-sec^2

Housing ..... Black non-corrosive finish

Bearings..... Precision ABEC ball bearings

Weight..... 11 oz typical

Environmental

Storage Temp ..... -25° to 85° C

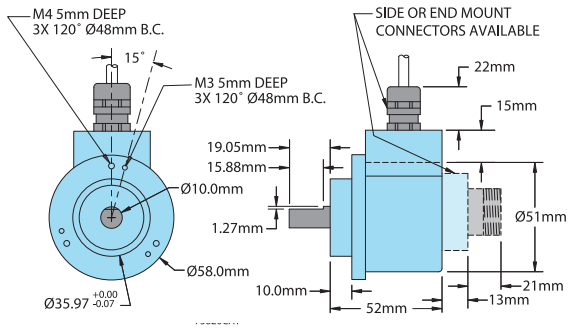
Humidity..... 98% RH non-condensing

Vibration..... 20 g @ 58 to 500 Hz

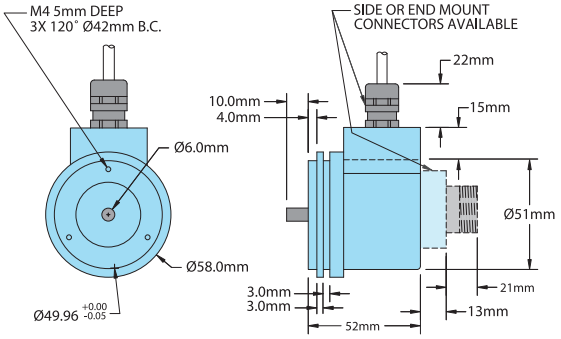
Shock..... 75 g @ 11 ms duration

Sealing..... IP50 standard; IP64, IP66 or IP67 optional

MODEL 758 CLAMPING FLANGE 20 TYPE (A)



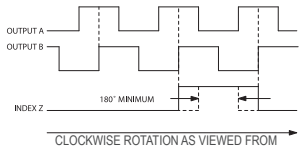
MODEL 758 SYNCHRO FLANGE 26 TYPE (B)



All dimensions are in millimeters with a tolerance of ±0.17 mm unless otherwise specified.

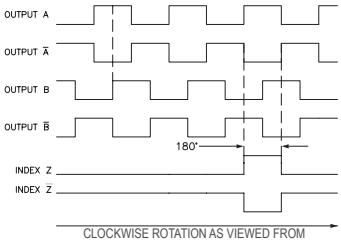
WAVEFORM DIAGRAMS

Open Collector and Pull-Up



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES.
INDEX IS POSITIVE GOING.

Line Driver and Push-Pull



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV AND H5 OUTPUTS ONLY.

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable. Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	5-pin M12**	8-pin M12**	10-pin MS	7-pin MS HV,H5	7-pin MS PU,PP P5,OC	12-pin M23
Com	Black	3	7	F	F	F	10
+VDC	Red	1	2	D	D	D	12
A	White	4	1	A	A	A	5
A'	Brown	--	3	H	C	--	6
B	Blue	2	4	B	B	B	8
B'	Violet	--	5	I	E	--	1
Z	Orange	5	6	C	--	C	3
Z'	Yellow	--	8	J	--	--	4
Shield	Bare*	--	--	--	--	--	--
+VDC Sense	--	--	--	--	--	--	2
Com Sense	--	--	--	--	--	--	11
Case	Green	--	--	G	G	G	9

*CE Option: Cable shield (bare wire) is connected to internal case.
†Standard cable is 24 AWG conductors with foil and braid shield.
**CE Option: Use cable cordset with shield connected to M12 connector coupling nut.

MODEL 802S

Ø2.0"

FEATURES

Industry Standard Size 20 (2" Diameter) Stainless Steel Package
Flange and Servo Mounting
Up to 30,000 CPR
80 lb Maximum Axial and Radial Shaft Loading
IP67 Sealing Available

The Model 802S Accu-Coder™ is a heavy duty, industry standard Size 20 (2.0" diameter) encoder specifically designed for harsh factory and plant floor environments. The Model 802S is available with a variety of flange and servo mounting styles, making it easy to use in a broad range of applications. Its heavy duty, double-shielded ball bearings are rated at 80 pounds maximum axial and radial shaft load, ensuring long operating life. This ultra-rugged yet compact encoder is housed in a Type 316 Stainless Steel enclosure, making it ideal for applications where contamination or exposure to caustic chemicals is a concern. Even with its tough exterior, the Model 802S provides the precise, reliable output you've come to expect from Accu-Coder™.

COMMON APPLICATIONS

Food Processing, Oil, Gas & Chemical Processing, Material Handling, Conveyors, Robotics, Elevator Controls, Textile Machines

MODEL 802S ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

802S – 20 – S – 1000 – R – HV – 1 – F – 1 – E – G – CE

MODEL
802S Size 20 (2.0")

SHAFT SIZE[1]
07 1/4", 0.250"
20 3/8", 0.375"
21 10 mm
30 3/8", 0.375"[2]

OPERATING TEMPERATURE
S 0° to 70° C
L -40° to 70° C[3]
H 0° to 100° C[4]

CYCLES PER REVOLUTION
1-30,000
Price adder for CPR>1270
(See table below)

NUMBER OF CHANNELS[5]
A Channel A
Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index
Channel B Leads A
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index

OUTPUT TYPE
5 - 28V In/Out[6]
OC Open Collector
PU Pull-Up Resistor
PP Push-Pull
HV Line Driver[7]
8 - 28V In/5V Out[8,9]
H5 Line Driver (5V)[7]
P5 Push-Pull (5V)

MAXIMUM FREQUENCY
1 100 kHz (Standard)
2 200 kHz ≤ 3000 CPR
5 250 kHz, >3000 CPR
3 500 kHz, >6000 CPR[10]
4 1 MHz, >10,000 CPR[10]

MOUNTING
Flange Mounts
F 1.181" Female Pilot
L 0.687" Male Pilot
G 1.250" Male Pilot
K Size 25 w/30 Shaft
Servo Mounts
S 1.181" Female Pilot
U 0.687" Male Pilot
T 1.250" Male Pilot
J Size 25 w/30 Shaft

SEALING
N No Seal
1 IP66
2 IP64
5 IP67

CONNECTOR LOCATION
E End
S Side

CONNECTOR TYPE[11]
G Gland, 24" cable[12]
J 5-Pin M12 (12mm)[7,13]
K 8-Pin M12 (12mm)[13]

CERTIFICATION
N None
CE CE Marked[14]

MODEL 802S CPR OPTIONS

0001*	0002*	0004*	0005*	0006*	0007*	0008*	0010*	0011*	0012*
0014*	0020	0021*	0024*	0025*	0028*	0030*	0032*	0033*	0034*
0035*	0038*	0040*	0042*	0045*	0050*	0060	0064*	0100	0120
0125	0128*	0144*	0150*	0160*	0192*	0200	0240*	0250	0254*
0256*	0300	0333*	0336*	0360	0400	0500	0512	0600	0625*
0635	0665*	0720	0768*	0800	0889	1000	1024	1200	1201*[a]
1203*[a]	1204*[a]	1250[a]	1270[a]	1440	1500	1800	2000	2048	2400[a]
2500	2540[a]	2880[a]	3000[a]	3600[a]	4000[a]	4096[a]	5000[a]	6000[a]	7200[a]
7500[a]	9000[a]	10,000[a]	10,240[a]	12,000[a]	12,500[a]	14,400[a]	15,000[a]	18,000[a]	20,000[a]
20,480[a]	25,000[a]	30,000[a]							

*Contact Customer Service for High Temperature Option.
[a]High Temperature Option (H) limited to 85° C maximum for these CPR options.

New CPR values are periodically added to those listed. Contact Customer Service to determine all currently available CPR values. Special disk resolutions are available upon request. A one-time NRE fee may apply.

NOTES:

1 Contact Customer Service for additional options.
2 Shaft with Size 25 Mounting Adapter, J or K mounting only.
3 Low temperature option not available with resolutions of 3000 CPR or higher.
4 0° to 85° C for certain resolutions, see CPR Options.
5 Contact Customer Service for non-standard index gating options.
6 24 VDC max for high temperature option.
7 Line Driver Outputs not available with 5-pin M12 connector.
8 Standard temperature, 60 to 3000 CPR only. Not available with 2540 CPR.
9 CE not available with H5/P5 output type options.
10 Standard cable lengths only. For details, please refer to Technical Bulletin ***TB116: Noise and Signal Distortion Considerations*** at encoder.com.
11 For mating connectors, cables, and cordsets see **Accessories** at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see **Connector Pin Configuration Diagrams** at encoder.com.
12 For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: G/6 = 6 feet of cable.
13 M12 connector available on side mount option only.
14 Please refer to Technical Bulletin ***TB100: When to Choose the CE Mark*** at encoder.com.

MODEL 802S SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 70° C
4.75 to 24 VDC for temperatures between 70° C and 100° C

Input Current ..... 100 mA max with no output load

Input Ripple..... 100 mV peak-to-peak at 0 to 100 kHz

Output Format..... Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mounting face. See *Waveform Diagrams*.

Output Types..... Open Collector – 100 mA max per channel
Pull-Up – Open Collector with 2.2K ohm internal resistor, 100 mA max per channel
Push-Pull – 20 mA max per channel
Line Driver – 20 mA max per channel (Meets RS 422 at 5 VDC supply)

Index..... Occurs once per revolution. The index for units >3000 CPR is 90° gated to Outputs A and B. See *Waveform Diagrams*.

Max Frequency ..... Up to 1 MHz.

Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.

Noise Immunity..... Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN50081-2

Symmetry..... 1 to 6000 CPR: 180° (±18°) electrical at 100 kHz output
6001 to 30,000 CPR: 180° (±36°) electrical

Quad Phasing..... 1 to 6000 CPR: 90° (±22.5°) electrical at 100 kHz output
6001 to 30,000 CPR: 90° (±36°) electrical

Min Edge Sep ..... 1 to 6000 CPR: 67.5° electrical at 100 kHz output
6001 to 20,480 CPR: 54° electrical
>20,480 CPR: 50° electrical

Rise Time..... Less than 1 microsecond

Accuracy..... Instrument and Quadrature Error: For 200 to 1999 CPR, 0.017° mechanical (1.0 arc minutes) from one cycle to any other cycle. For 2000 to 3000 CPR, 0.01° mechanical (0.6 arc minutes) from one cycle to any other cycle. Interpolation error (units >3000 CPR only) within 0.005° mechanical. (Total Optical Encoder Error = Instrument + Quadrature + Interpolation)

Mechanical

Max Shaft Speed..... 8000 RPM. Higher shaft speeds may be achievable, contact Customer Service.

Radial Shaft Load ..... 80 lb max. Rated load of 20 to 40 lb for bearing life of 1.5 x 10^9 revolutions

Axial Shaft Load ..... 80 lb max. Rated load of 20 to 40 lb for bearing life of 1.5 x 10^9 revolutions

Starting Torque ..... 1.0 oz-in typical with IP64 seal or no seal
3.0 oz-in typical with IP66 shaft seal
7.0 oz-in typical with IP67 shaft seal

Moment of Inertia ... 5.2 x 10^{-4} oz-in-sec^2

Housing ..... Type 316 Stainless Steel

Bearings..... Precision ABEC ball bearings

Weight..... 1.5 lb typical

Environmental

Storage Temp ..... -25° to 85° C

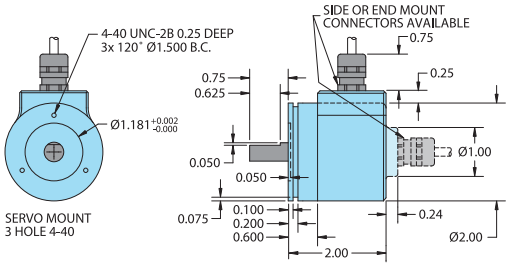
Humidity..... 98% RH non-condensing

Vibration..... 20 g @ 58 to 500 Hz

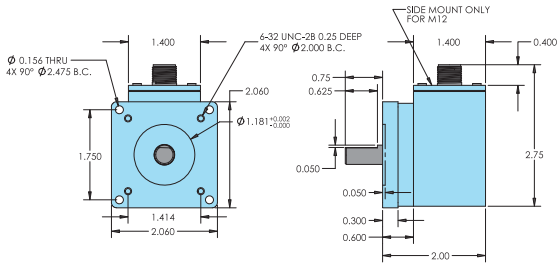
Shock..... 75 g @ 11 ms duration

Sealing..... IP50 standard; IP64, IP66, IP67 optional

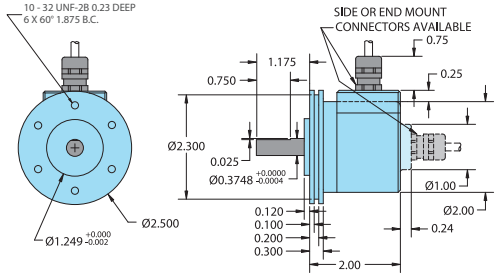
MODEL 802S SERVO MOUNT (S)



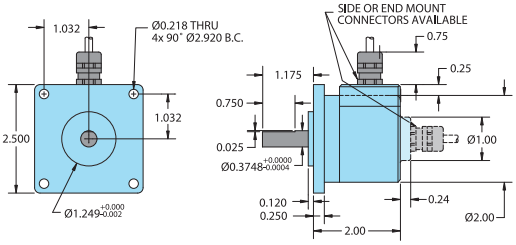
MODEL 802S FLANGE MOUNT (F)



MODEL 802S SIZE 25 (2.5") SERVO MOUNT (J)



MODEL 802S SIZE 25 (2.5") FLANGE MOUNT (K)



All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable. Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	5-pin M12**	8-pin M12**
Com	Black	3	7
+VDC	Red	1	2
A	White	4	1
A'	Brown	--	3
B	Blue	2	4
B'	Violet	--	5
Z	Orange	5	6
Z'	Yellow	--	8
Case	Green	--	--
Shield	Bare*	--	--

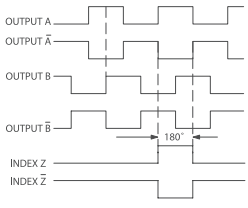
*CE Option: Cable Shield (bare wire) is connected to internal case.

†Standard cable is 24 AWG conductors with foil and braid shield.

**CE Option: Use cable cordset with shield connected to M12 connector coupling nut.

WAVEFORM DIAGRAMS

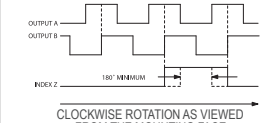
Line Driver and Push-Pull



CLOCKWISE ROTATION AS VIEWED FROM THE MOUNTING FACE

NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV OR H5 OUTPUTS ONLY.

Open Collector and Pull-Up



CLOCKWISE ROTATION AS VIEWED FROM THE MOUNTING FACE

NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. INDEX IS POSITIVE GOING.

MODEL 858S

FEATURES

Industry Standard Size 58 (58 mm Diameter) Stainless Steel Package
Up to 30,000 CPR
80 lb Maximum Axial and Radial Shaft Loading
100° C Operating Temperature Available
IP67 Sealing Available

The Model 858S European Size 58 Accu-Coder™ is a heavy duty, extremely rugged, reliable encoder, in a 316 stainless steel package. Its compact design is well suited for harsh factory and plant floor environments that call for a metric solution. The double-shielded ball bearings are rated at 80 pound maximum axial and radial shaft loading, to ensure a long operating life. Shock rating is 75 g for 11 milliseconds duration. With the optional heavy-duty shaft seal installed, the Model 858S is rated at IP67. Two European standard mounting options are available, the Clamping Flange (20 Type), or the Synchro Flange (26 Type).

COMMON APPLICATIONS

Food Processing, Oil, Gas & Chemical Processing, Material Handling, Conveyors, Robotics, Elevator Controls, Textile Machines

MODEL 858S ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

858S – A – 21 – S – 1000 – R – HV – 1 – 1 – E – G – CE

MODEL
858S Size 58 mm

MOUNTING TYPE[1]
A 20 Type Clamping
B 26 Type Synchro

SHAFT SIZE[1]
07 1/4", 0.250"
20 3/8", 0.375"
06 6 mm
21 10 mm

OPERATING TEMPERATURE
S 0° to 70° C
L -40° to 70° C[2]
H 0° to 100° C[3]

CYCLES PER REVOLUTION
1-30,000
Price adder for CPR >1270
(See table below)

NUMBER OF CHANNELS[4]
A Channel A
Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index
Channel B Leads A
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index

OUTPUT TYPE
5-28V In/Out[5]
OC Open Collector
PU Pull-Up Resistor
PP Push-Pull
HV Line Driver[6]
8-28V In/5V Out[7,8]
H5 Line Driver (5V)[6]
P5 Push-Pull (5V)

MAXIMUM FREQUENCY
1 100 kHz (Standard)
2 200 kHz ≤ 3000 CPR
5 250 kHz, >3000 CPR
3 500 kHz, >6000 CPR[9]
4 1 MHz, >10,000 CPR[9]

SEALING
N No Seal
1 IP66
2 IP64
5 IP67

CONNECTOR LOCATION
E End
S Side

CONNECTOR TYPE[10]
G Gland, 24" cable[11]
J 5-Pin M12 (12mm)[6,12]
K 8-Pin M12 (12mm)[12]

CERTIFICATION
N None
CE CE Marked[13]

MODEL 858S CPR OPTIONS

0001*	0002*	0004*	0005*	0006*	0007*	0008*	0010*	0011*	0012*
0014*	0020	0021*	0024*	0025*	0028*	0030*	0032*	0033*	0034*
0035*	0038*	0040*	0042*	0045*	0050*	0060	0064*	0100	0120
0125	0128*	0144*	0150*	0160*	0200	0240*	0250	0254*	0256*
0300	0333*	0336*	0360	0400	0500	0512	0600	0625*	0635
0665*	0720	0768*	0800	0889	1000	1024	1200	1201*[a]	1203*[a]
1204*[a]	1250[a]	1270[a]	1440	1500	1800	2000	2048	2400[a]	2500
2540[a]	2880[a]	3000[a]	3600[a]	4000[a]	4096[a]	5000[a]	6000[a]	7200[a]	7500[a]
9000[a]	10,000[a]	10,240[a]	12,000[a]	12,500[a]	14,400[a]	15,000[a]	18,000[a]	20,000[a]	20,480[a]
25,000[a]	30,000[a]								

*Contact Customer Service for High Temperature Option.
[a]High Temperature Option (H) limited to 85° C maximum for these CPR options.

New CPR values are periodically added to those listed. Contact Customer Service to determine all currently available CPR values. Special disk resolutions are available upon request. A one-time NRE fee may apply.

NOTES:

1 The shaft on 20 Type mountings includes a 15.58mm flat. The shaft on 26 Type mountings is provided without a flat.
2 Low temperature option not available with resolutions of 3000 CPR or higher.
3 0° to 85° C for certain resolutions, see CPR Options.
4 Contact Customer Service for non-standard index gating options.
5 24 VDC max for high temperature option.
6 Line Driver Outputs not available with 5-pin M12 connector.
7 Standard temperature, 60 to 3000 CPR only. Not available with 2540 CPR.
8 CE not available with H5/P5 output type options.
9 Standard cable lengths only. For details, please refer to Technical Bulletin ***TB116: Noise and Signal Distortion Considerations*** at encoder.com.
10 For mating connectors, cables, and cordsets see **Accessories** at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see **Connector Pin Configuration Diagrams** at encoder.com.
11 For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: G/6 = 6 feet of cable.
12 M12 connector available on side mount option only.
13 Please refer to Technical Bulletin ***TB100: When to Choose the CE Mark*** at encoder.com.

MODEL 858S SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 70° C
4.75 to 24 VDC for temperatures between 70° C to 100° C

Input Current ..... 100 mA max with no output load

Input Ripple..... 100 mV peak-to-peak at 0 to 100 kHz

Output Format..... Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the encoder mounting face. See *Waveform Diagrams*.

Output Types ..... Open Collector – 100 mA max per channel
Pull-Up – Open Collector with 2.2K ohm internal resistor, 100 mA max per channel
Push-Pull – 20 mA max per channel
Line Driver – 20 mA max per channel
(Meets RS 422 at 5 VDC supply)

Index..... Occurs once per revolution. The index for units >3000 CPR is 90° gated to Outputs A and B. See *Waveform Diagrams*.

Max Frequency ..... Up to 1 MHz.

Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.

Noise Immunity..... Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN50081-2

Symmetry..... 1 to 6000 CPR: 180° (±18°) electrical at 100 kHz output
6001 to 30,000 CPR: 180° (±36°) electrical

Quad Phasing..... 1 to 6000 CPR: 90° (±22.5°) electrical at 100 kHz output
6001 to 30,000 CPR: 90° (±36°) electrical

Min Edge Sep ..... 1 to 6000 CPR: 67.5° electrical at 100 kHz output
6001 to 20,480 CPR: 54° electrical
>20,480 CPR: 50° electrical

Rise Time..... Less than 1 microsecond

Accuracy..... Instrument and Quadrature Error: For 200 to 1999 CPR, 0.017° mechanical (1.0 arc minutes) from one cycle to any other cycle. For 2000 to 3000 CPR, 0.01° mechanical (0.6 arc minutes) from one cycle to any other cycle. Interpolation error (units > 3000 CPR only) within 0.005° mechanical. (Total Optical Encoder Error = Instrument + Quadrature + Interpolation)

Mechanical

Max Shaft Speed..... 8000 RPM. Higher shaft speeds may be achievable, contact Customer Service.

Radial Shaft Load ..... 80 lb max. Rated load of 20 to 40 lb for bearing life of 1.5 x 10^9 revolutions

Axial Shaft Load ..... 80 lb max. Rated load of 20 to 40 lb for bearing life 1.5 x 10^9 revolutions

Starting Torque ..... 1.0 oz-in typical with IP64 seal or no seal
3.0 oz-in typical with IP66 shaft seal
7.0 oz-in typical with IP67 shaft seal

Moment of Inertia ... 5.2 x 10^{-4} oz-in-sec^2

Housing ..... Type 316 Stainless Steel

Bearings..... Precision ABEC ball bearings

Weight..... 1.5 lb typical

Environmental

Storage Temp ..... -25° to 85° C

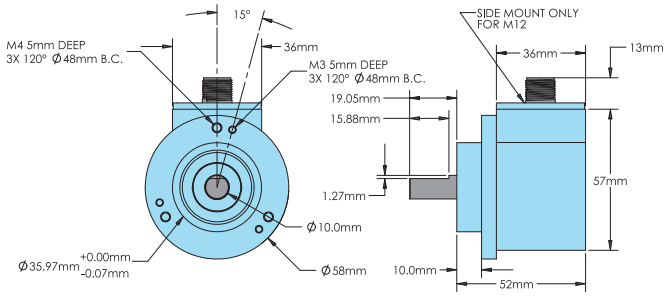
Humidity..... 98% RH non-condensing

Vibration..... 20 g @ 58 to 500 Hz

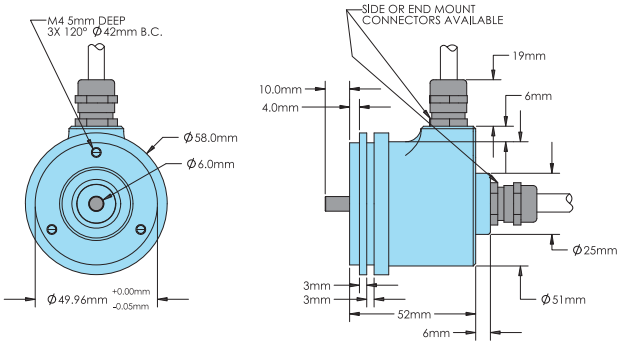
Shock..... 75 g @ 11 ms duration

Sealing..... IP50 standard; IP64, IP66, IP67 optional

MODEL 858 CLAMPING FLANGE 20 TYPE (A)



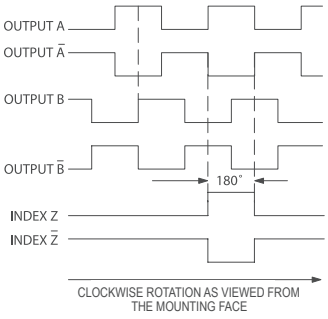
MODEL 858 SYNCHRO FLANGE 26 TYPE (B)



All dimensions are in millimeters with a tolerance of ±0.17 mm unless otherwise specified.

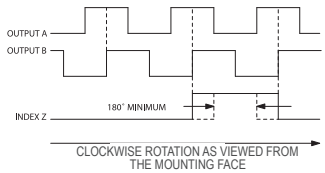
WAVEFORM DIAGRAMS

Line Driver and Push-Pull



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV AND H5 OUTPUTS ONLY.

Open Collector and Pull-Up



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES.
INDEX IS POSITIVE GOING.

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.
Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	5-pin M12**	8-pin M12**
Com	Black	3	7
+VDC	Red	1	2
A	White	4	1
A'	Brown	--	3
B	Blue	2	4
B'	Violet	--	5
Z	Orange	5	6
Z'	Yellow	--	8
Shield	Bare*	--	--
Case	Green	--	--

*CE Option: Cable Shield (bare wire) is connected to internal case.
†Standard cable is 24 AWG conductors with foil and braid shield.
**CE Option: Use cable cordset with shield connected to M12 connector coupling nut.

MODEL 865T

Ø6.5"

FEATURES

A C-Face Thru-Bore Encoder with Stainless Steel Housing
Fits NEMA Size 56C Thru 184C Motor Faces (4.5" AK)
Slim Profile – Only 1.00" Deep
Incorporates Opto-ASIC Technology
Resolutions to 4096 CPR

The Model 865T C-Face encoder is a rugged, high resolution encoder designed to mount directly on NEMA C-Face motors. Both sides of the encoder are C-Face mounts, allowing additional C-Face devices to be mounted to this encoder. Unlike many C-Face kit type encoders, the Model 865T contains precision bearings and an internal flex mount, virtually eliminating encoder failures and inaccuracies induced by motor shaft runout or axial endplay. The advanced Opto-ASIC design provides advanced noise immunity necessary for many industrial applications. This encoder is ideal for applications using induction motors and flux vector control. The 1.00" thick model 865T provides speed and position information for drive feedback in a slim profile. The thru-bore design allows fast and simple mounting of the encoder directly to the accessory shaft or to the drive shaft of the motor, using the standard motor face (NEMA sizes 56C - 184C). The tough Type 316 Stainless Steel housing resists the corrosion and hazards of a caustic industrial environment.

COMMON APPLICATIONS

Motor Feedback, Velocity & Position Control, Conveyors, Variable Speed Drives, Mixing & Blending Motors, Assembly & Specialty Machines

MODEL 865T ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Mechanical | Electrical | Optional Features (Leave Blank for Standard Options)

865T	–	34	H1	–	0500	N	V1	R	OC	–	F02	–			
MODEL		BORE SIZE	HOUSING STYLE		CYCLES PER REVOLUTION		INPUT VOLTAGE	NUMBER OF CHANNELS[3]	OUTPUT TYPE		CONNECTOR TYPE[5]		OPERATING TEMPERATURE (0° to 70° C std)		CERTIFICATION (None Std)

MODEL
865T 4.5" NEMA "AK" Dimension, Stainless Steel Thru-Bore

BORE SIZE
11 5/8", 0.625"
34 3/4", 0.750"
18 7/8", 0.875"
80 1", 1.000"
13 14 mm
19 19 mm
24 24 mm

HOUSING STYLE
H1 Thru-Bore housing version with IP50 dust seal[1]
H2 Cover completely encloses motorshaft and eliminates access to motor shaft; IP66 rated.

CYCLES PER REVOLUTION
See *CPR Options* below
Price adder for CPR >1024

INPUT VOLTAGE
V1 5 to 28 VDC[2]

NUMBER OF CHANNELS[3]
Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index
Channel B Leads A
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index
See http://www.encoder.com/literature/index-phasing.pdf for additional options, and waveforms.

OUTPUT TYPE
OC Open Collector
PU Pull-Up Resistor
PP Push-Pull
HV Line Driver[4]

CONNECTOR TYPE[5]
F02 24" Cable with Gland Nut[6]
SMJ 5-Pin M12[4]
SMK 8-Pin M12

OPERATING TEMPERATURE
0° to 70° C (Std)
T4 0° to 100° C

CERTIFICATION
None (Std)
CE CE Marked[7]

MODEL 865T CPR OPTIONS

0060 0100 0120 0240 0250 0256 0500
0512 1000 1024 2048 2500 4096

Contact Customer Service for other disk resolutions; not all disk resolutions available with all output types.

NOTES:
1 Housing style H1 Thru-Bore version equipped with IP50 dust seal. Unit must be mounted between two C-Face devices with supplied gasket kit to be IP66 sealed.
2 5 to 24 VDC max for high temperature option.
3 Contact Customer Service for index gating options.
4 Line Driver Output not available with 5-Pin M12 connector.
5 For mating connectors, cables, and cordsets see Accessories at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see Connector Pin Configuration Diagrams at encoder.com.
6 For non-standard cable lengths enter 'F' plus cable length expressed in feet. Example: F06 = 6 feet of cable.
7 Please refer to Technical Bulletin *TB100: When to Choose the CE Mark* at encoder.com.

MODEL 865T SPECIFICATIONS

Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 70° C
4.75 to 24 VDC for temperatures between 70° C and 100° C

Input Current ..... 100 mA max with no output load

Input Ripple..... 100 mV peak-to-peak at 0 to 100 kHz

Output Format..... Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the mounting face.
See *Waveform Diagrams*.

Output Types..... Open Collector – 100 mA max per channel
Pull Up – Open Collector with 2.2K ohm internal resistor, 100 mA max per channel
Push-Pull – 20 mA max per channel
Line Driver – 20 mA max per channel
(Meets RS 422 at 5 VDC supply)

Index..... Once per revolution.
0001 to 0474 CPR: Ungated
0475 to 4096 CPR: Gated to output A
See *Waveform Diagrams*.

Max Frequency ..... 200 kHz

Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.

Noise Immunity..... Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN55022 (with European compliance option); BS EN61000-6-2; BS EN50081-2

Quadrature..... 67.5° electrical or better is typical,
Edge Separation 54° electrical minimum at temperatures > 99°C

Rise Time..... Less than 1 microsecond

Mechanical

Max Shaft Speed..... 6000 RPM. Higher shaft speeds may be achievable, contact Customer Service.

Bore Tolerance ..... +0.0015"/-0.000"

User Shaft Tolerances
Radial Runout ..... 0.005"
Axial Endplay..... +0.050"

Moment of Inertia ... 3.3 x 10^{-3} oz-in-sec^2 typical

Housing ..... Type 316 Stainless Steel

Weight..... 6 lb typical

Environmental

Storage Temp ..... -25° to 100°C

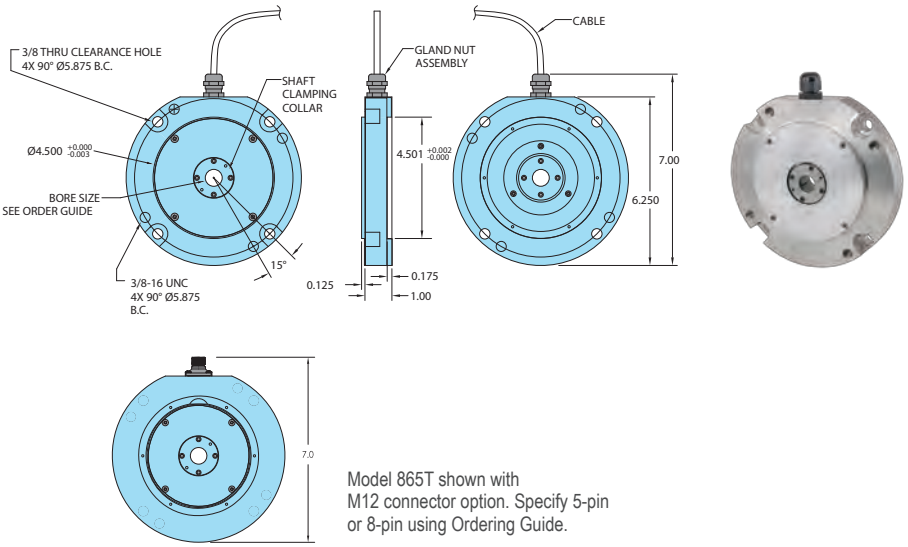
Humidity..... 98% RH non-condensing

Vibration..... 10 g @ 58 to 500 Hz

Shock..... 50 g @ 11 ms duration

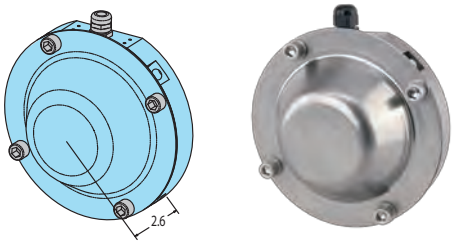
Sealing..... IP66 when mounted between two C-Face devices with supplied gasket kit, or with H1 cover. IP50 if not installed in either manner.

MODEL 865T CONNECTOR OPTIONS



Model 865T shown with M12 connector option. Specify 5-pin or 8-pin using Ordering Guide.

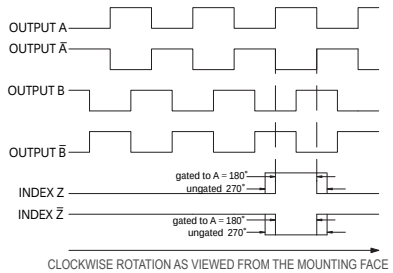
MODEL 865T OPTIONAL HOUSING COVER (H2)



All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.

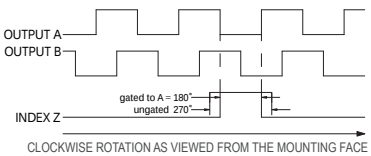
WAVEFORM DIAGRAMS

Line Driver and Push-Pull



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV OUTPUT ONLY.

Open Collector and Pull-Up



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES
INDEX IS POSITIVE GOINGS

WIRING TABLE

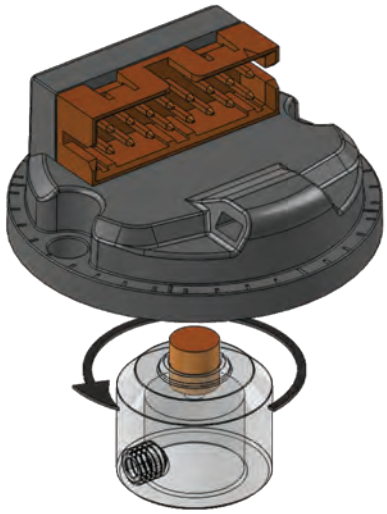
For EPC-supplied mating cables, refer to wiring table provided with cable.

Trim back and insulate unused wires.

Function	Gland Cable† Wire Color	5-pin M12* PU, PP, OC	8-pin M12*
Com	Black	3	7
+VDC	Red	1	2
A	White	4	1
A'	Brown	--	3
B	Blue	2	4
B'	Violet	--	5
Z	Orange	5	6
Z'	Yellow	--	8
Shield	Bare	--	--

*CE Option: Use cable cordset with shield connected to M12 connector coupling nut.
†Standard cable is 24 AWG conductors with foil and braid shield.

MODEL 30M



Ø30 mm/1.181"

FEATURES

Large Air Gap and Tolerance to Misalignment
Resolutions of 1 to 1024 CPR (4096 PPR with Quadrature Counting)
Optional 2-Pole to 32-Pole Commutation
Sealing Options to IP69K
Operating Temperature Range -40° to 120° C
Easy Alignment and Installation

The Model 30M is a compact, incremental encoder module with advanced magnetic sensing and signal processing technology. Featuring resolutions from 1 to 1024 CPR, commutation channels, several output types and two supply voltage options, it can be configured for a wide range of industrial, commercial and consumer feedback applications. With a non-contact magnetic sensor and optional sealing up to IP69K, the Model 30M can be applied in environments where dirt, dust and liquids are present.

COMMON APPLICATIONS

Servo/stepper motor feedback, Mobile equipment speed and steering sensing, Timber processing machinery, Studio lighting and stage equipment control, Rotary valve position monitoring and control, Solar panel positioning, Vending machines, Punch presses, Tank level monitoring, Robotics

MODEL 30M ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

30M – 00 – 0256 N V5 R3 HV – C –

MODEL
30M Incremental Encoder Module

CPR
0001 - 1024

MAGNET
00 No Magnet[1]
RM Ø4 mm magnet

Over Shaft Magnet Holders w/Bore Size (includes magnet)
21 3/16", 0.1875"
01 1/4", 0.250"
03 5/16", 0.3125"
02 3/8", 0.375"
05 1/2", 0.500"
11 5/8", 0.625"
06 5 mm
04 6 mm
14 8 mm
10 10 mm
13 14 mm

Press In/On Magnet Holder (Includes magnet)
48 0.250" Bore/0.125" Shaft

COMMUTATION[2]
Commutation only available with V5 Option
N No Commutation[3]
F 2 Pole
A 4 Pole
B 6 Pole
C 8 Pole
E 10 Pole
D 12 Pole
G 14 Pole
H 16 Pole
J 18 Pole
K 20 Pole
L 22 Pole
M 24 Pole
O 26 Pole
P 28 Pole
R 30 Pole
T 32 Pole

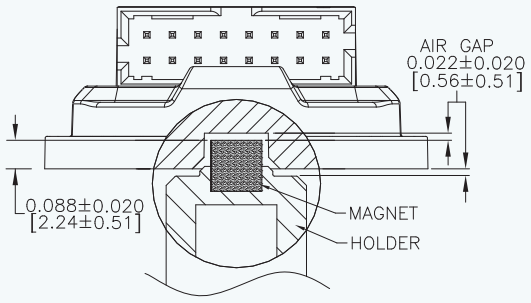
INPUT VOLTAGE
V5 5 VDC[4]
V1 5 to 28 VDC

CHANNEL
R3 Quadrature A&B w\ Index
D3 Reverse Quad A&B w\ Index

OUTPUT TYPE
HV Differential Line Driver
OC Open Collector[4]
PP Push-Pull

CONNECTOR TYPE
C 8-Pin Molex Header[2]
V 16-Pin Molex Header[3]
K 8-Pin M12[2,5]

SEALING
Leave Blank for Standard Option
IP50 (Std)
S6 IP69K[6]



Nominal Magnet Position

NOTES:
1 A high-quality magnet is required to generate a reliable signal; magnet options provided by EPC have been pre-qualified to provide a clear and reliable signal.
2 Commutation is not available with 8-pin M12 or 8-pin Molex Header.
3 16-pin Molex Header is only available with Commutation.
4 OC Output Type and 8-pin M12 are not available with V5 Input Voltage option.
5 8-pin M12 only available in V1 Input Voltage option.
6 IP69K sealing available with 8-Pin M12 Connector Type only.

MODEL 30M SPECIFICATIONS

Electrical

Input Voltage..... 5 VDC ±10% Fixed Voltage
4.5 to 28 VDC (4.5 to 20 VDC over 105°C)

Input Current ..... 80 mA max, 50 mA or less typical with no output load

Output Format..... Two square waves in quadrature with channel A leading B for clockwise magnet rotation as viewed from the encoder mounting face. Index gated to A and B.

Output Types..... Open Collector
Open Collector with Differential Outputs
Differential Line Driver (Meets RS422 at 5 VDC)
Push-Pull
All outputs 20 mA max per channel

Max Frequency ..... 350 kHz

Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.

Min Edge Sep ..... 20° electrical typical @ 25° C

Accuracy..... Typically within ±0.7° mechanical from true position. Accuracy improves at nominal air gap with minimized magnet runout, offset and endplay.

Mechanical/Environmental

Operating Temp ..... -40° C to 120° C; reduced to 110° C max above 200 KHz with 20V input and 20mA/channel output

Air Gap ..... 0.022" nominal recommended

User Shaft Tolerances
- Axial Endplay..... ±0.020" max
- Radial Runout ..... 0.008" max
- Axial Offset..... 0.008" max

Mounting Bolts ..... Max Ø0.200" Head, 2-56 or M2.5 Button, Socket or Pan Head or 4-40 Socket Head

Housing Material ..... High Temp, Toughened Nylon Composite

Weight..... 0.5 oz typical or less

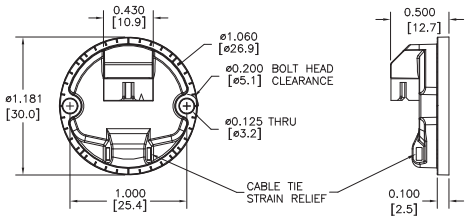
Humidity..... 98% RH non-condensing

Vibration..... 20 g @ 10 to 2000 Hz (MIL-STD-202G Method 204D)

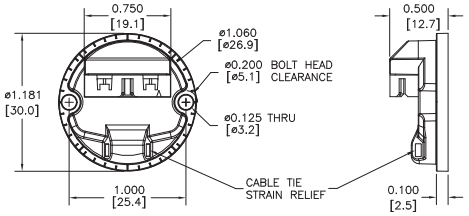
Shock..... 100 g @ 11 ms duration (MIL-STD-202G Method 213B)

Sealing..... IP50 standard; IP69K available with M12 connector option

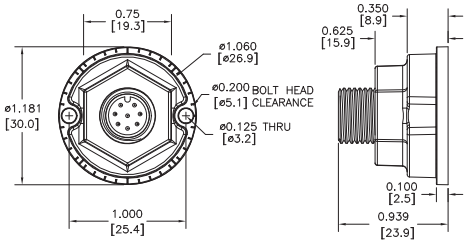
8-PIN MOLEX HEADER OPTION (C)



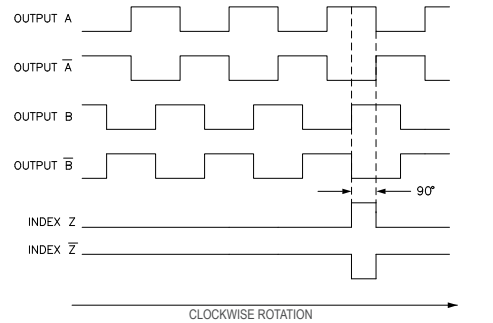
16-PIN MOLEX HEADER OPTION (V)



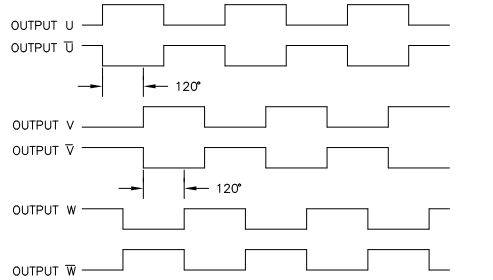
8-PIN M12 OPTION (K)



WAVEFORM DIAGRAMS



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV OUTPUT ONLY.

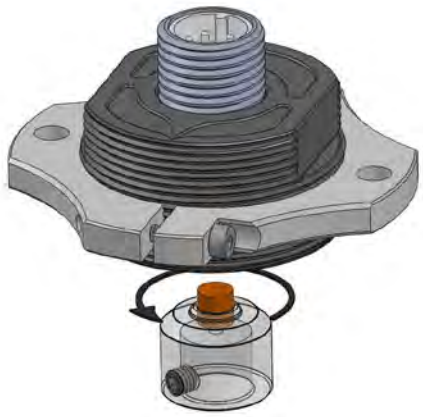


WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable. Trim back and insulate unused wires

Function	8-pin M12	8-pin Header	16-pin Header
Com	7	4	8
+VDC	2	2	6
A	1	8	12
A'	3	6	10
B	4	5	9
B'	5	7	11
Z	6	1	5
Z'	8	3	7
U	--	--	2
U'	--	--	1
V	--	--	14
V'	--	--	13
W	--	--	4
W'	--	--	-3

MODEL 30MT



Ø30 mm/1.181"

FEATURES

Large Air Gap and Tolerance to Misalignment
Resolutions of 1 to 1024 CPR (4096 PPR with Quadrature Counting)
Sealing Options to IP69K
Operating Temperature Range -40° to 120° C
Easy Alignment and Installation

The Model 30MT Accu-Coder™ is a compact, incremental encoder module with advanced magnetic sensing and signal processing technology. With a built-in alignment feature, the threaded housing allows for quick, accurate air-gap setting. Featuring resolutions from 1 to 1024 CPR, several output types, and a wide range for supply voltage, it can be configured for a variety of industrial, commercial and consumer feedback applications. The non-contact magnetic sensor and optional sealing up to IP69K allows the Model 30MT to be applied in environments where dirt, dust and liquids are present.

COMMON APPLICATIONS

Motor Feedback, Mobile Equipment Speed and Steering Sensing, Timber Processing Machinery, Studio Lighting and Stage Equipment Control, Rotary Valve Position Monitoring and Control, Solar Panel Positioning, Vending Machines, Punch Presses, Tank Level Monitoring, Robotics

MODEL 30MT ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

30MT – 00 – 0256 N V1 R3 HV – K –

MODEL
30MT Threaded Incremental Encoder Module

MAGNET
00 No Magnet[1]
RM Ø4 mm magnet

Over Shaft Magnet Holders w/Bore Size (includes magnet)
21 3/16", 0.1875"
01 1/4", 0.250"
03 5/16", 0.3125"
02 3/8", 0.375"
05 1/2", 0.500"
11 5/8", 0.625"
06 5 mm
04 6 mm
14 8 mm
10 10 mm
13 14 mm

Press In/On Magnet Holder (Includes magnet)
48 0.250" Bore/0.125" Shaft

CYCLES PER REVOLUTION
0001 to 1024

INPUT VOLTAGE
V1 5 to 28 VDC

CHANNEL
R3 Quadrature A&B w\ Index
D3 Reverse Quad A&B w\ Index

OUTPUT TYPE
HV Differential Line Driver
OC Open Collector
PP Push-Pull

CONNECTOR TYPE
K 8-Pin M12

SEALING
Leave Blank for Standard Option
IP50 (Std)
S6 IP69K

NOTES:
1 A high-quality magnet is required to generate a reliable signal; magnet options provided by EPC have been pre-qualified to provide a clear and reliable signal.

MODEL 30MT SPECIFICATIONS

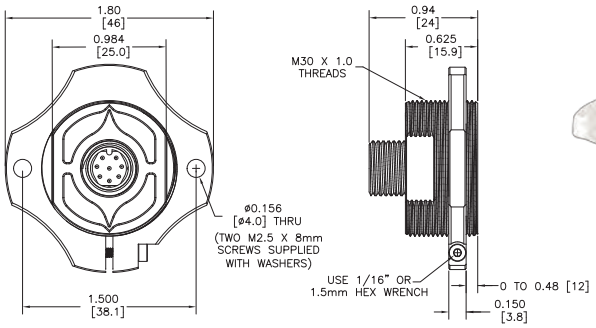
ELECTRICAL

Input Voltage..... 4.5 to 28 VDC (4.5 to 20 VDC over 105°C)
Input Current ..... 80 mA max, 50 mA or less typical with no output load
Output Format ..... Two square waves in quadrature with channel A leading B for clockwise magnet rotation as viewed from the encoder mounting face. Index gated to A and B.
Output Types..... Open Collector
Open Collector with Differential Outputs
Differential Line Driver (Meets RS422 at 5 VDC)
Push-Pull
All outputs 20 mA max per channel
Max Frequency ..... 350 kHz
Electrical Protection .. Reverse voltage and output short circuit protected.
Min Edge Sep ..... 20° electrical typical @ 25° C
Accuracy..... Typically within ±0.7° mechanical from true position. Accuracy improves at nominal air gap with minimized magnet runout, offset and endplay.

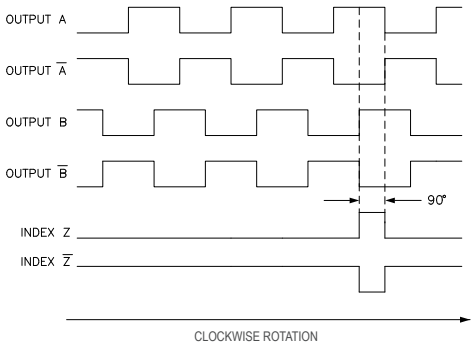
MECHANICAL/ENVIRONMENTAL

Operating Temp ..... -40° C to 120° C; reduced to 110° C max above 200 KHz with 20V input and 20mA/channel output
Air Gap ..... 0.022" nominal recommended
User Shaft Tolerances
Axial Endplay..... ±0.020" max
Radial Runout ..... 0.008" max
Axial Offset..... 0.008" max
Mounting Bolts ..... Two m2.5 x 8mm screws with washers provided
Housing Material ..... High Temp, Toughened Nylon Composite
Weight..... 0.7 oz typical or less (with clamping nut)
Humidity..... 98% RH non-condensing
Vibration..... 20 g @ 10 to 2000 Hz (MIL-STD-202G Method 204D)
Shock..... 100 g @ 11 ms duration (MIL-STD-202G Method 213B)
Sealing..... IP50 standard; IP69K available

MECHANICAL DRAWING



WAVEFORM DIAGRAMS



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV OUTPUT ONLY.

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable. Trim back and insulate unused wires.

Function	8-pin M12
Com	7
+VDC	2
A	1
A'	3
B	4
B'	5
Z	6
Z'	8

UNIVERSAL MOUNTING ADAPTOR
Stock #176672

Provides the following mounting patterns, 2x @ 180°:

Ø1.142 [Ø29.0] B.C.

Ø1.280 [Ø32.5] B.C.

Ø1.500 [Ø38.1] B.C.

Ø1.575 [Ø40.0] B.C.

Ø1.811 [Ø46.0] B.C

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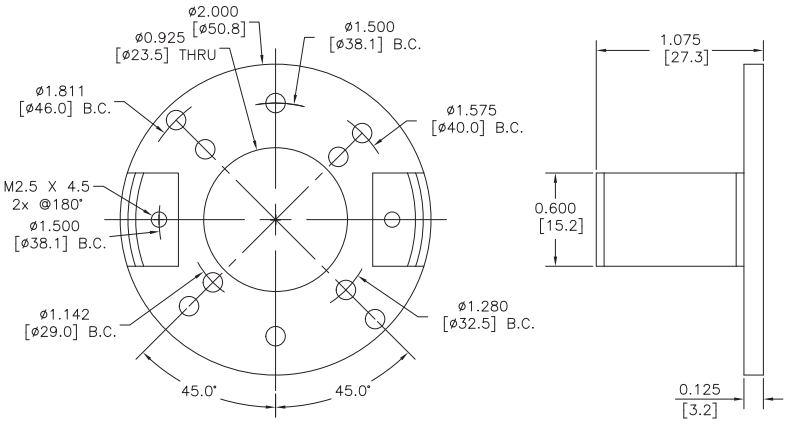
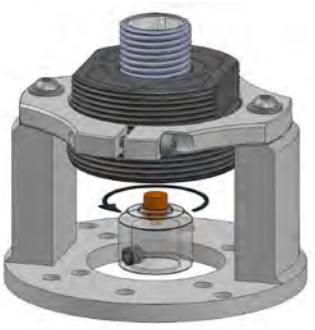


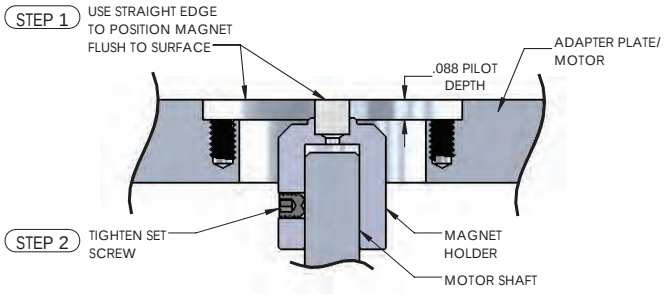
NOTE: ALL HOLES ARE ø0.125 [ø3.2] THRU, 2x @180°.

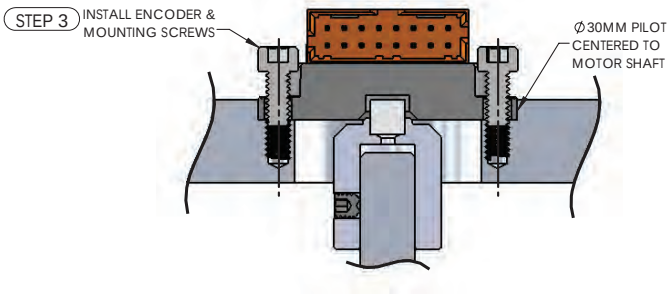


MODELS 30M & 30MT ACCESSORIES

PREFERRED INSTALLATION

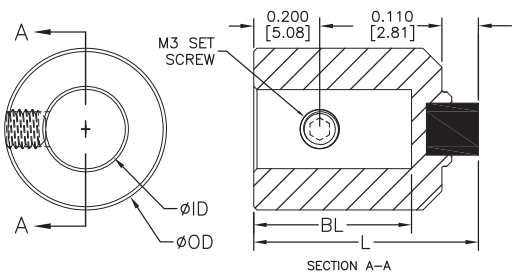
Contact EPC Application Support for assistance with additional installation options.





OVER SHAFT MAGNET HOLDERS

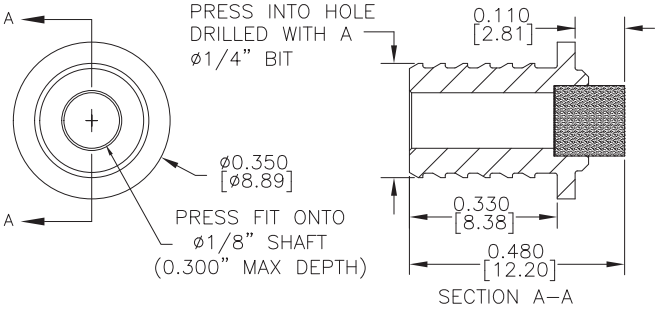
STOCK #	ØID	ØOD	BL	L
176596-01	3/16" (0.1875")	0.365	0.375	0.580
176597-01	5mm (0.1969")	0.365	0.375	0.580
176598-01	6mm (0.2362")	0.490	0.375	0.580
176599-01	1/4" (0.2500")	0.490	0.375	0.580
176600-01	5/16" (0.3125")	0.490	0.475	0.680
176601-01	8mm (0.3150")	0.490	0.475	0.680
176602-01	3/8" (0.3750")	0.615	0.475	0.680
176603-01	10mm (0.3937")	0.615	0.475	0.680
176604-01	1/2" (0.5000")	0.740	0.750	0.955
176605-01	14mm (0.5512")	0.740	0.750	0.955
176606-01	5/8" (0.6250")	0.865	0.750	0.955



Over Shaft Magnet Holder

PRESS IN/ON MAGNET HOLDER

Stock # 176607-01



Press In/On Magnet Holder

MATING CABLES/CORDSETS

Molex Mating Cables (24 AWG Wires)	
Stock #	**Description**
075230	8-pin Molex Mating Connector w/ 24" Cable
075232	16-Pin Molex Mating Connector w/ 24" Cable

M12 Mating Cordsets	
Stock #	**Description**
075100	8-Pin M12 Mating Cordset, 0.5 Meters
075101	8-Pin M12 Mating Cordset, 2 Meters
075102	8-Pin M12 Mating Cordset, 4 Meters
075103	8-Pin M12 Mating Cordset, 6 Meters
075104	8-Pin M12 Mating Cordset, 10 Meters

WHEN TO CHOOSE A MAGNETIC ENCODER MODULE

Magnetic encoder modules can be used in a wide range of applications, including, but certainly not limited to, the following:

- Servo/stepper motor feedback
- Mobile equipment speed and steering sensing
- Timber processing machinery
- Studio lighting and stage equipment control
- Rotary valve position monitoring and control
- Solar panel positioning
- Vending machines
- Punch presses
- Tank level monitoring
- Robotics

The Model 30M Incremental Magnetic Encoder Module has 3 connector options.

There are many points to consider when trying to determine if an encoder module is the best solution for your application.

1. You need an encoder with a bearingless design. In the vast majority of applications, an encoder with bearings is the best choice, because it provides an easier installation and a more stable platform for the encoder to run on. However, there are instances where a bearingless encoder is a better option:

- In your application, there are factors that are hard on bearings. Magnetic encoder modules tend to be more tolerant to shock and vibration – factors that typically shorten bearing life. If your encoder will be subjected to factors that are hard on bearing life, a magnetic encoder module might be the right encoder solution for your application.
- You need an encoder that can work in a high-speed application. An encoder's bearings often limit operational speed to 12,000 RPMs or less. If you need to run at higher speeds, a bearing-less module might be the solution.
- Cost is a major factor. Since encoder modules have no bearings and associated support parts, they often cost less and can be more economical. If cost is a factor, an encoder module might be the right solution.

2. You have limited space. It can happen for different reasons. Maybe the encoder was overlooked in the design phase, and you suddenly find yourself with very little space for a key component in your configuration. Maybe the constraints of your machine's design simply won't allow more space. In any case, magnetic encoder modules tend to be compact in size, but – when designed well – will still give you the accurate feedback and motion control you need.

3. You need versatile mounting options. The "magnetic" in "magnetic encoder module" gives you some options you may not have with typical encoders. Even with the tolerance for a large air gap and tolerance for misalignment, you may still have a tricky installation that requires a creative solution. Both the Model 30M and the Model 30MT have been designed with that in mind, and they are easy to mount and install.

The Model 30MT Incremental Magnetic Encoder Module comes with a threaded housing.

4. You need a heavy-duty seal on your encoder. Not all magnetic encoder modules offer heavy-duty sealing options, so be sure to check the IP Ratings (see page 137 for more information). If you need protection from washdown, you cannot settle for IP50. Conversely, if your encoder will be fairly well protected, it might not make sense to pay for a higher IP Seal than you need. EPC's Model 30M and Model 30MT are compact magnetic encoder modules with sealing options up to IP69K and an operating temperature range of -40° to 120° C, so it can handle the most extreme industrial environments.

With a large air gap and tolerance to misalignment, up to 1024 CPR (4096 PPR with Quadrature Counting), optional 2, 4 or 8 pole commutation, and easy alignment and installation, the Model 30M or the threaded Model 30MT are excellent solutions when you need a magnetic encoder module. Contact EPC today and you'll talk to real engineers who can help you incorporate the 30M or 30MT into your application.

MODEL 121

Ø2.1"
Patent #6,608,300B2

FEATURES
Simple, Hassle Free Mounting
Accepts Larger Shafts up to 5/8" (or 15 mm)
Up to 12 Pole Commutation Available
0° to 100° C Operating Temperature Available
Patented Design
Includes IP50 Dust Seal Kit

EPC has taken the performance of modular encoders to a new level with the Model 121 Auto-Aligning Modular Encoder. This new and innovative design requires no calibration, gapping or special tools for hassle-free installation. The Model 121 incorporates the latest Opto-ASIC technology for enhanced performance. Common problems with other modular encoder designs are warping and deflection, caused by their extensive use of plastic, both of which are virtually eliminated by the Model 121's all metal construction. For brushless servo motor applications, the Model 121 can be specified with three commutation tracks to provide motor feedback. The optional 100° C temperature capability allows servo motors to operate at higher power outputs and duty cycles.

COMMON APPLICATIONS
Servo Motor Control, Robotics, Specialty Assembly Machines, Digital Plotters, High Power Motors

MODEL 121 ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

121 – N – A – 5 – 01 – S – 0256 – Q – OC – 1 – S – N

MODEL
121 Auto-Aligning Modular Thru-Bore

COMMUTATION[1]
N No Commutation
C4 4 Pole
C6 6 Pole
C8 8 Pole
C12 12 Pole

MOUNTING & HOUSING STYLE
A Mounting Style A

INPUT VOLTAGE
5 5 VDC

BORE SIZE[2]
01 1/4", 0.250"
03 5/16", 0.3125"
02 3/8", 0.375"
10 1/2", 0.500"
11 5/8", 0.625"
06 5 mm
04 6 mm
14 8 mm
05 10 mm
12 12 mm
13 14 mm
15 15 mm

OPERATING TEMPERATURE
S 0° to 70° C
H 0° to 100° C

CYCLES PER REVOLUTION
See *CPR Options* below
Price adder >1999

NUMBER OF CHANNELS[3]
Channel A Leads B
Q Quadrature A & B
R Quadrature A & B with Index
Channel B Leads A
K Reverse Quadrature A & B
D Reverse Quadrature A & B with Index
See http://www.encoder.com/literature/index-phasing.pdf for additional options, and waveforms.

OUTPUT TYPE
OC Open Collector
PP Push-Pull
HV Line Driver

MAXIMUM FREQUENCY
1 100 kHz
2 200 kHz
3 300 kHz[4]

CONNECTOR TYPE
S 18" Cable[5]

CERTIFICATION
N None
CE CE Marked[6]

MODEL 121 CPR OPTIONS

0200	0250	0254	0256	0300	0360	0500
0512	0600	0720	0800	0840	1000	1024
1200	1250	1800*	2000*	2048*	2500*	

*Contact Customer service for application analysis.

New CPR values are periodically added to those listed. Contact Customer Service to determine all currently available values. Special disk resolutions are available upon request and may be subject to a one-time NRE fee.

NOTES:

1. Not available in all configurations. Contact Customer Service for availability.
2. Contact Customer Service for additional options not shown.
3. Contact Customer Service for non-standard index gating options.
4. Standard 0° to 70° C operating temperature only.
5. For Non-Standard Cable Lengths add a forward slash (/) plus cable length expressed in feet. Example: S/6 = 6 feet of cable.
6. Please refer to Technical Bulletin ***TB100: When to Choose the CE Mark*** at encoder.com.

MODEL 121 SPECIFICATIONS

Electrical

Input Voltage..... 5 VDC +10% Fixed Voltage
Input Current..... 130 mA max (< 100 mA typical) with no output loadwith no output load
Output Format..... Incremental – Two square waves in quadrature with channel A leading B for clockwise shaft rotation, as viewed from the mounting face. Index optional.
Output Types..... Open Collector – 20 mA per channel max
Push-Pull – 20 mA per channel max
Line Driver – 20 mA max per channel
(Meets RS 422 at 5 VDC supply)
Index..... Once per revolution gated to channel A. Contact Customer Service for additional gating options.
Max Frequency ..... 100 kHz standard, 200 kHz, and 300 kHz optional
Electrical Protection .. Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.
Quadrature..... 67.5° electrical or better is typical, 54°
Edge Separation..... electrical minimum at temperatures > 99° C
Accuracy..... Within 0.1° mechanical from one cycle to any other cycle, or 6 arc minutes
Commutation..... Optional – three 120° electrical phase tracks for commutation feedback. (4, 6, 8, or 12 poles. Others available upon request.)
Comm. Accuracy ..... 1° mechanical

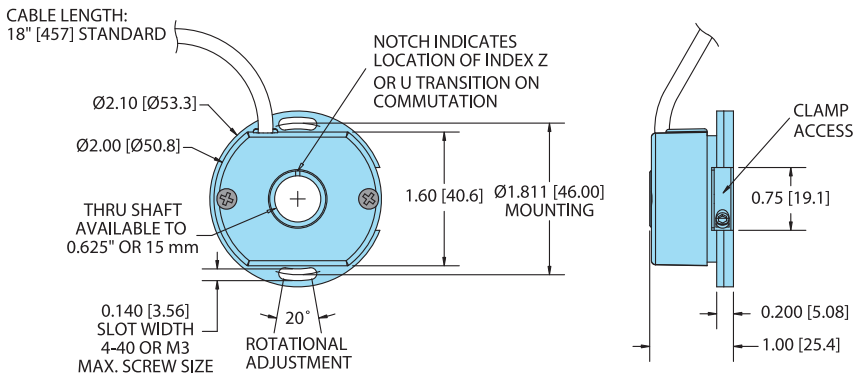
Mechanical

Max. Shaft Speed..... Determined by maximum frequency response
Bore Tolerance..... +0.0007" (max) -0.0000" (Based on H7 bore fit for g6 shaft Class LC5 per ANSI B-4.1 standard)
User Shaft Tolerance
Radial Runout ..... 0.002" max
Axial End Play..... ±0.015" for CPR <= 512
±0.010" for CPR 513 to 1250
±0.005" for CPR > 1250
Moment of Inertia ... 2.5 x 10^{-4} oz-in-sec^2
Max. Acceleration ... 5 x 10^5 rad/sec^2
Housing ..... All Metal Aluminum and Zinc Alloy
Weight..... 4 oz typical

Environmental

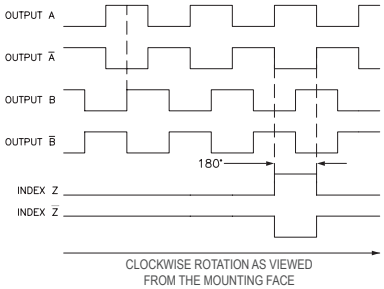
Storage Temp ..... -25° to 100° C
Humidity..... 98% RH non-condensing
Vibration..... 10 g @ 58 to 500 Hz
Shock..... 50 g @ 11 ms duration

MODEL 121 AUTO-ALIGNING MODULAR (A)

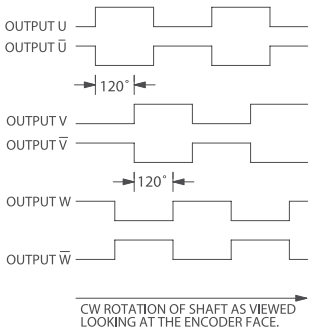


All dimensions are in inches with a tolerance of +0.005" or +0.01" unless otherwise specified.
Metric dimensions are given in brackets [mm].

WAVEFORM DIAGRAMS



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV OUTPUT ONLY.



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES.

WIRING TABLE

For EPC-supplied mating cables, refer to wiring table provided with cable.
Trim back and insulate unused wires.

Function	Flying Leads Cable† Wire Color
Com	Black
+VDC	White
A	Brown
A'	Yellow
B	Red
B'	Green
Z	Orange
Z'	Blue
U	Violet
U'	Gray
V	Pink
V'	Tan
W	Red/Green
W'	Red/Yellow
Shield	Bare*

*CE Option: Cable shield (bare wire) is connected to internal case.
†Standard cable for non-commutated models is 24 AWG For commutated units, conductors are 28 AWG.

DOES YOUR ENCODER SIGNAL NEED SOME HELP?

One Is Better than Four: One Unit Can Convert, Split, Repeat and Test Your Encoder Signal

Generally, when you hook up your encoder, it's already configured to provide the correct digital outputs. Those outputs then feed directly to a counter, controller, or other device. In some applications, however, the encoder signal needs optimization to reach the receiving device over long distances. Or you need to provide the encoder signal to more than one device. Or you need to change the type of output signal. That's where EPC's RX/TX products come in: product variations are available to convert, repeat, or split the signal (see pages 118 – 120).

Our RX/TXD, however, combines all of these capabilities into a compact DIN rail mountable unit – plus, it can test your signal. The RX/TXD all-in-one:

- Can be configured as a level changer, signal converter, line repeater, splitter, or tester.
- Splits one input signal into two or three outputs.
- Has LED indicators for encoder power and signal presence.
- Accommodates a variety of digital signal types (RS422, NPN, PNP, TTL, etc.) and voltages (5VDC or 5-24VDC) as both input and output options, allowing for use with all EPC encoders.
- Is compact and lightweight. The DIN Rail mountable PC/ABS housing makes for easy and versatile installation.
- Has LED indicators for encoder power and signal presence.
- Is easy to use. All connections can be made via easily accessible screw terminals to a detachable 17-pin connector.

When to Use the RX/TXD

Signal Converter

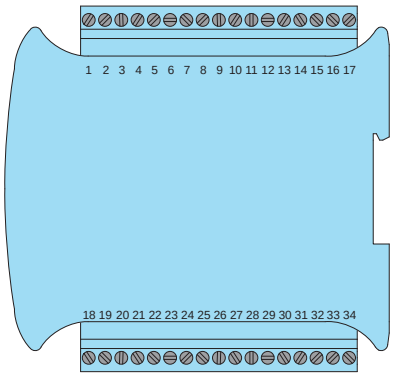
In many retrofit or upgrade projects, your encoders may need to interface with newer devices – and they may have mismatched input requirements. That's when the RX/TXD's level changer/conditioner capability is ideal. For example, a 24VDC open collector output can be converted to a 5VDC RS422 compatible differential line-driver – an output type better suited for long cable runs or electrically noisy environments. It keeps your signal clean and consistent.

Signal Splitter

When a single encoder has to provide signals to multiple devices, the RX/TXD can split one signal into two or three identical outputs. Using the splitter capability can eliminate the need for multiple encoders, which gives you greater design flexibility.

Signal Repeater

When your encoder signal needs to transmit over long distances, the RX/TXD can be configured as a signal repeater. This not only eliminates the risk of voltage drop, it also ensures your signal integrity.



TMNL	SIGNAL		TMNL	SIGNAL	
1	Z'		18	N/C	
2	Z		19	Z'	
3	B'		20	Z	
4	B	*Output 3 Signals*	21	B'	
5	A'		22	B	*Output 1 Signals*
6	A		23	A'	
7	COM		24	A	
8	N/C		25	COM	
9	Z'		26	N/C	
10	Z		27	Z'	
11	B'		28	Z	
12	B	*Output 2 Signals*	29	B'	*Input Signals from Encoder*
13	A'		30	B	
14	A		31	A'	
15	COM		32	A	
16	COM	*Input Power*	33	COM	*Encoder Supply*
17	+VDC		34	+VDC	

All inputs and outputs may not be present, depending on the RX/TXD version.

When you're troubleshooting a closed-loop control system, you need to know if the encoder is functioning properly so you don't waste time looking at the wrong components. The RX/TXD does that for you; it has a series of LED lights on the front panel that tell you if the power is on, and if it is still receiving a signal.

The RX/TXD also accommodates voltages in a regulated range of 5-24VDC or fixed 5VDC as both input and output options, as well as a variety of digital signal types, including RS422, NPN, PNP, and TTL (and more – contact us for more options).

Get it FAST

As with all our products, EPC's standard lead time on the RX/TXD is just 4 to 6 business days, with expedite options available. And of course, it's covered by EPC's industry-leading 3-year warranty. View the datasheet on pages 116 – 117, or go to encoder.com to configure and download a 3D model to drop into your application drawing.

For more information on how the RX/TXD can fit into your application, contact EPC today. When you call EPC, you'll talk to real engineers and encoder experts who can answer your toughest, most technical encoder questions. Give us a call.

RX / TXD RECEIVER–TRANSMITTER UNIT VERSATILE ENCODER INTERFACE

FEATURES
DIN Rail Mount
Level Changes from Vcc to 5V
Signal Conditioner or Repeater for Distance Transmission
2 or 3 Way Splitter/Level Changer
Encoder Tester/Verifier

This lightweight DIN rail mountable unit, Line Driver and Line Receiver is composed of a PC/ABS self-extinguishing material blend. Configurable as a level changer, line repeater, splitter or encoder tester, the RX/TXD will accept TTL, RS422, RS485, PP, NPN, NPN OC, or PNP encoder inputs at 5V, or HTL, PP, NPN, NPN OC & PNP at 5-24V. It will provide up to three outputs in any combination of TTL, RS422, RS485, PP, at 5V, or HTL, PP at 5-24V. A series of LEDs on the front panel indicates power and signal presence. Connections are made via the easily accessible screw terminals as standard. This device may be used as both a Line Driver and Line Receiver.

RX/TXD ORDERING GUIDE

Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

Electrical

RXTXD – 1 – V3 – 5V – 5H – 4P – 4H – 5P

MODEL
RXTXD Receiver/Transmitter

VERSION
1 Receiver/Transmitter (one set of outputs)
2 Receiver/Transmitter (two sets of outputs)
3 Receiver/Transmitter (three sets of outputs)

INPUT VOLTAGE
V5 5V Only
V3 5-24V[1]

ENCODER/SENSOR POWER
5V 5V Only
24V 5-24 Vcc[2]

INPUT SIGNAL
5H 5V Differential Driver[3]
5N 5V NPN Open-Collector
5P 5V Push-Pull S/Ended[2,4]
24H 24V Differential Driver[5]
24N 24V NPN Open-Collector
24P 24V Push-Pull S/Ended[6]

One Output
Two Outputs
Three Outputs

FINAL OUTPUT SIGNAL
5H 5V Differential Driver[3]
5P 5V Push-Pull S/Ended[4]
4H 24V Differential Driver[5]
4P 24V Push-Pull S/Ended[6]

NOTES:
1 24V Maximum Voltage.
2 Encoder/Sensor and output signal voltages are limited to the input voltage supplied. 5P Input Signal not available with 5-24Vcc option.
3 TTL, RS422 & RS485 Compatible.
4 TTL, NPN (Sink), PNP (Source), PP.
5 HTL Compatible.
6 NPN (Sink), PNP (Source), PP.

RX/TXD SPECIFICATIONS

Electrical

Input Voltage..... 5V to 24V Max

Current
Consumption..... 250 mA Typical

Repeater Output
Voltage ..... 5V or Vcc

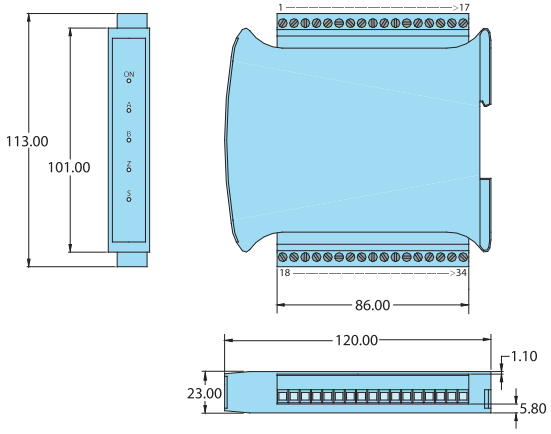
Frequency
Response..... Up to 800 Khz

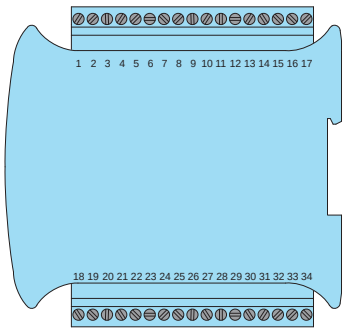
Output Current ..... 30 mA/ Channel Max

Mechanical

Weight..... 250g
Enclosure..... PC/ABS, IP20
Terminal ..... Screw Type 30/12 AWG

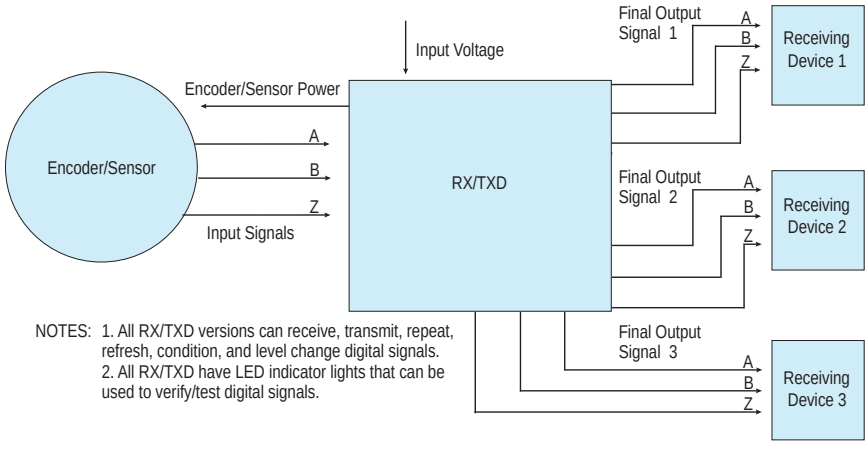
RX/TXD RECEIVER-TRANSMITTER





TMNL	SIGNAL		TMNL	SIGNAL	
1	Z'		18	N/C	
2	Z		19	Z'	
3	B'		20	Z	
4	B	*Output 3 Signals*	21	B'	
5	A'		22	B	*Output 1 Signals*
6	A		23	A'	
7	COM		24	A	
8	N/C		25	COM	
9	Z'		26	N/C	
10	Z		27	Z'	
11	B'		28	Z	
12	B	*Output 2 Signals*	29	B'	*Input Signals from Encoder*
13	A'		30	B	
14	A		31	A'	
15	COM		32	A	
16	COM	*Input Power*	33	COM	*Encoder Supply*
17	+VDC		34	+VDC	

All inputs and outputs may not be present, depending on the RX/TXD version.



NOTES: 1. All RX/TXD versions can receive, transmit, repeat, refresh, condition, and level change digital signals.
2. All RX/TXD have LED indicator lights that can be used to verify/test digital signals.

RX/TX CONVERTER

FEATURES

The RX/TX Converter converts a Push-Pull or NPN encoder output to an RS422 compatible differential Line Driver output. In addition, it will also convert Line Driver/RS422 encoder output to single ended signals (Push-Pull) for compatibility with certain PLC's.

Each converter has two independent channels: Channel 1 is equipped with a differential Line Receiver on the input. It then converts these differential signals (A, A', B, B', Z, Z') to Push-Pull output signals (A, B, Z), with an amplitude equivalent to Vcc.

Channel 2 will convert single ended signals from a Push-Pull or NPN Open Collector encoder to Differential Line Driver signals. Differential Line Driver signals include complementary outputs A', B', and Z' which offer greater immunity to electrical noise, signal distortion, and interference, especially with long cable runs.

APPLICATIONS

To provide differential signals for data transmission over long distances between a push-pull, or NPN open collector transmitter and receiver. To enable devices with different output/input circuits to be connected. To properly terminate differential signals to eliminate/reduce signal distortions.

RX/TX CONVERTER ORDERING INFORMATION

(Specify stock # when ordering)

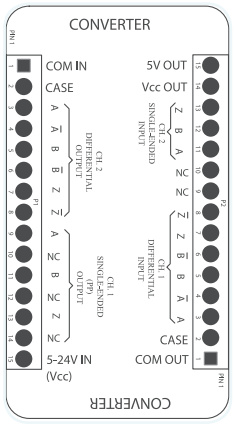
Differential = A,A', B,B', Z,Z'
Single Ended = A, B, Z

	Channel 1		Channel 2	
	INPUT	OUTPUT	INPUT	OUTPUT
Stock #	Differential Line Reciever MAX 3095	Single Ended Push Pull Output 7272	Single Ended 7272	Differential Line Driver 7272
100020-1	5V	Vcc	5V, OC[1]	Vcc
100020-2	5V	Vcc	5V, OC[1]	5V
100020-3	5V	Vcc	5V[2]	Vcc
100020-4	5V	Vcc	5V[2]	5V
100020-5	6-12V	Vcc	5V, OC[1]	Vcc
100020-6	6-12V	Vcc	5V, OC[1]	5V
100020-7	6-12V	Vcc	5V[2]	Vcc
100020-8	6-12V	Vcc	5V[2]	5V
100020-9	13-24V	Vcc	5V, OC[1]	Vcc
100020-10	13-24V	Vcc	5V, OC[1]	5V
100020-11	13-24V	Vcc	5V[2]	Vcc
100020-12	13-24V	Vcc	5V[2]	5V

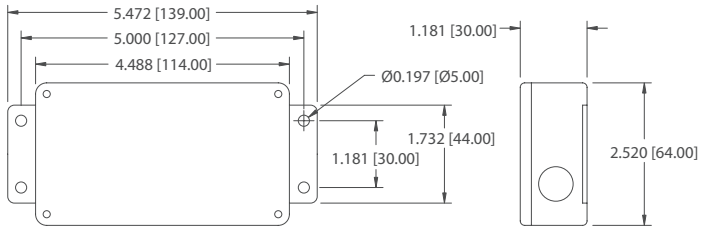
[1]OC- Open Collector input designed with a 2k pull-up resistor for an open collector output encoder or device.
[2]Inputs can be from devices with pull-up, push-pull or TTL type outputs.
[3]Vcc should range between 5-24 VDC

SPECIFICATIONS

Supply Source (Vcc) ..... 5 to 24 VDC
Current Consumption ..... 20 mA max (plus encoder and output load requirements)
Max Frequency ..... Up to 1 MHz
Enclosure ..... IP54 (dust proof)
Earth Circuit ..... Grounded to Case
Input Voltage ..... Channel 1: 24 VDC Max Diff
Channel 2: 5 VDC Max
Output Voltage ..... Channel 1: Vcc
Channel 2: 5 VDC or Vcc
Output Current ..... 30 mA/Channel Max



NOTES UNLESS OTHERWISE SPECIFIED
1. TERMINATE CABLE SHIELD/DRAIN WIRES TO THE CASE TERMINAL OF P1 AND P2, IF APPLICABLE. BARE CONDUCTORS MUST BE ELECTRICALLY INSULATED FROM THE CIRCUIT BOARD WITH A NONCONDUCTIVE SLEEVE SUCH AS HEAT SHRINK TUBING.
2. RECOMMENDED CABLE FOR DIFFERENTIAL/ COMPLEMENTARY ENCODER SIGNALS: LOW CAPACITANCE, TWISTED-SHIELDED PAIR: SEE ACCESSORIES SECTION FOR 4XXC CABLES/CONNECTORS. 4XXC CABLES MUST HAVE OUTER INSULATION STRIPPED OFF IN ORDER TO FIT THROUGH CABLE ENTRY GLANDS.
3. SEE CONFIGURATION ORDERING GUIDE FOR INPUT/OUTPUT VOLTAGE PER THE SELECTED RXTX MODEL NUMBER
4. P2-14 (Vcc) or P2-15 (5V) CAN BE USED TO POWER ENCODER.
5. P1-15 (5-24VDC IN (Vcc)) IS FOR CUSTOMER SUPPLIED POWER TO OPERATE RXTX.



All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.
Metric dimensions are given in brackets [mm].

RX/TX REPEATER

FEATURES

The RX/TX Repeater retransmits signals from an encoder output in order to drive signals over a longer distance with reduced noise and distortion free waveforms. The input is equipped with a Differential Line Receiver and a Differential Line Driver. It takes the differential signals (A, A', B, B', Z, Z') , squares the signals up, and then repeats the signals at the outputs.

Benefits are greater immunity from electrical noise, signal distortion, and interference, especially with long cable runs. The output signal can be 5 VDC or an amplitude equivalent to Vcc.

APPLICATIONS

Repeat differential signals for data transmission over long distances. To properly terminate differential signals to eliminate/reduce signal distortions. Increase output current drive capability in order to drive multiple receivers

SPECIFICATIONS

Supply Source (Vcc)..... 5 to 24 VDC
Current Consumption ..... 20 mA max (plus encoder and output load requirements)
Max Frequency ..... Up to 1 MHz
Enclosure..... IP54 (dust proof)
Earth Circuit ..... Grounded to Case
Input Voltage..... 24 VDC Max Diff
Output Voltage..... 5 VDC or Vcc
Output Current ..... 30 mA/Channel Max

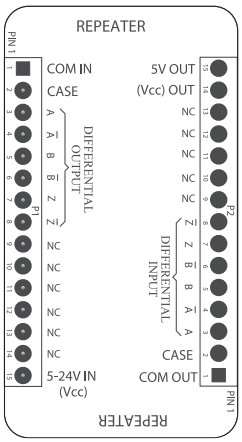
RX/TX REPEATER ORDERING INFORMATION

(Specify stock # when ordering)

Differential = A,A', B,B', Z,Z'
For differential signals only

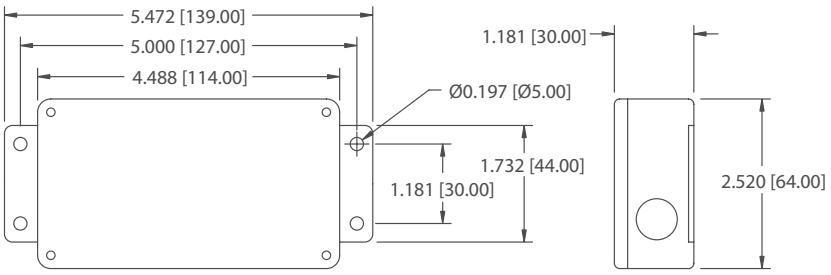
Stock #	INPUT Differential Line Receiver - MAX 3095	OUTPUT Differential Line Driver 7272
100020-13	5V	5V
100020-14	5V	Vcc[2]
100020-15	6-12V	5V
100020-16	6-12V	Vcc[2]
100020-17	13-24V	5V-
100020-18	13-24V	Vcc[2]

[1]Vcc should range between 5-24 VDC.
[2]Outputs will be equivalent to voltage applied to Vcc (Pin P1-15)



NOTES UNLESS OTHERWISE SPECIFIED

1. TERMINATE CABLE SHIELD/DRAIN WIRES TO THE CASE TERMINAL OF P1 AND P2, IF APPLICABLE. BARE CONDUCTORS MUST BE ELECTRICALLY INSULATED FROM THE CIRCUIT BOARD WITH A NONCONDUCTIVE SLEEVE SUCH AS HEAT SHRINK TUBING.
2. RECOMMENDED CABLE FOR DIFFERENTIAL/ COMPLEMENTARY ENCODER SIGNALS: LOW CAPACITANCE, TWISTED-SHIELDED PAIR: SEE ACCESSORIES SECTION FOR 4XXC CABLES/CONNECTORS. 4XXC CABLES MUST HAVE OUTER INSULATION STRIPPED OFF IN ORDER TO FIT THROUGH CABLE ENTRY GLANDS.
3. SEE CONFIGURATION ORDERING GUIDE FOR INPUT/OUTPUT VOLTAGE PER THE SELECTED RXTX MODEL NUMBER
4. P2-14 (Vcc) or P2-15 (5V) CAN BE USED TO POWER ENCODER.
5. P1-15 (5-24VDC IN (Vcc)) IS FOR CUSTOMER SUPPLIED POWER TO OPERATE RXTX.



All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.
Metric dimensions are given in brackets [mm].

RX/TX SPLITTER

RX/TX SPLITTER ORDERING INFORMATION

(Specify stock # when ordering)

Differential = A,A', B,B', Z,Z'
Single Ended = A, B, Z

Stock #	INPUT TYPE	INPUT VOLTAGE (From Encoder)	OUTPUT VOLTAGES (single ended or differential-7272) CH1	CH.2
100020-20	Differential	5V	5V	5V
100020-21	Differential	5V	Vcc	Vcc
10002022	Differential	5V	Vcc	5V
100020-23	Differential	6-12V	5V	5V
100020-24	Differential	6-12V	Vcc	Vcc
100020-25	Differential	6-12V	Vcc	5V
100020-26	Differential	13-24V	5V	5V
100020-27	Differential	13-24V	Vcc	Vcc
100020-28	Differential	13-24V	Vcc	5V
100020-29	Single Ended	5V OC	5V	5V
100020-30	Single Ended	5-24V OC	Vcc	Vcc
100020-31	Single Ended	5V OC	Vcc	5V
100020-32	Single Ended	5V PP, PU, TTL	5V	5V
100020-33	Single Ended	5-24V PP, PU, TTL	Vcc	Vcc
100020-34	Single Ended	5V PP, PU, TTL	Vcc	5V

[1]Choose an input channel of signal type differential or single ended that is to be split into two output channels. These input signals are typically from an incremental encoder. Refer to the block diagram below for the input and output signal flow.
[2]For OC type inputs, 2K ohm resistors are used for pull-up internally.
[3]The output channels may be used in the differential mode (A,A', B,B', Z,Z') or as A, B, Z (PP) referenced to circuit common.
[4]Vcc is the RXTX Splitter supply voltage and ranges from 5 to 24 VDC.
[5]Single ended input voltage must be less than or equal to the output voltage (Vcc or 5V), Whichever is applicable.
[6]Vcc (5-24VDC) or a PCB generated 5V is supplied to the output drivers (channels).

FEATURES

The RX/TX Splitter has one input and two separate output channels. There are two different types of inputs available. One input type is a differential line receiver where differential input signals (A, A', B,B',Z,Z') are split into two identical differential output channels. Alternatively, the input can be configured for a single ended Push-Pull, NPN, Open Collector, or Pull-Up encoder (A,B,Z), which will split the signal into two independent differential line driver outputs (A, A', B,B',Z,Z'). Refer to the block diagram below for the signal flow through the device. Line Driver signals include complementary outputs A', B', and Z', and offer greater immunity from electrical noise, signal distortion, and interference especially with long cable runs. The output signal can be approximately 5 VDC or a voltage amplitude equivalent to the RXTX supply (Vcc).

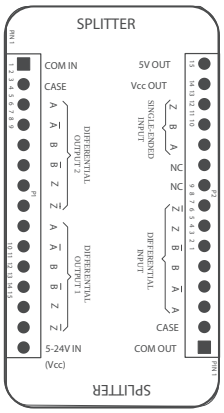
To order, choose the type of input (differential or single ended), the expected encoder signal voltage and the voltage output options. Use the RXTX Splitter ordering guide below to establish the stock number.

APPLICATIONS

To split differential, or single ended signals for data transmission over long or short distances to two different devices. To properly terminate differential signals to eliminate/reduce signal distortion. To increase output current drive capability in order to drive multiple receivers. To split the input signal and provide the two output channel drivers with differing voltage outputs.

SPECIFICATIONS

Supply Source (Vcc)..... 5 to 24 VDC
Current Consumption ..... 20 mA max (plus encoder & output load requirements)
Max Frequency ..... Up to 1 MHz
Enclosure..... IP54 (dust proof)
Earth Circuit ..... Grounded to Case
Input Voltage..... 24 VDC Max Diff
Output Voltage.....5 VDC or Vcc
Output Current.....30 mA/Channel Max



NOTES UNLESS OTHERWISE SPECIFIED
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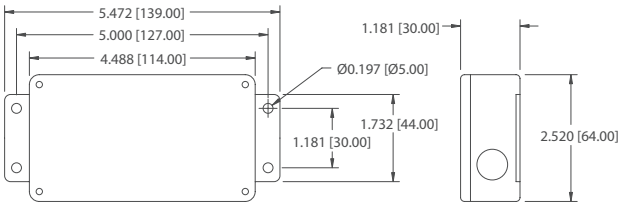
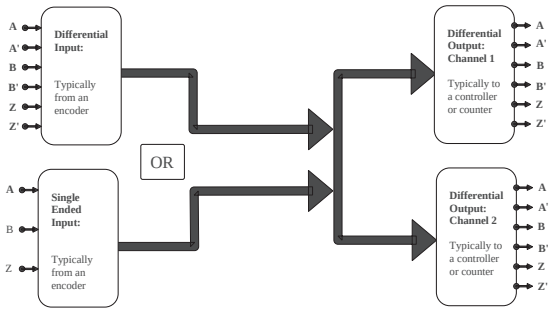
2. RECOMMENDED CABLE FOR DIFFERENTIAL/ COMPLEMENTARY ENCODER SIGNALS: LOW CAPACITANCE, TWISTED-SHIELDED PAIR: SEE ACCESSORIES SECTION FOR 4XXC CABLES/CONNECTORS. 4XXC CABLES MUST HAVE OUTER INSULATION STRIPPED OFF IN ORDER TO FIT THROUGH CABLE ENTRY GLANDS.
3. SEE CONFIGURATION ORDERING GUIDE FOR INPUT/OUTPUT VOLTAGE PER THE SELECTED RXTX MODEL NUMBER
4. P2-14 (Vcc) or P2-15 (5V) CAN BE USED TO POWER ENCODER.
5. P1-15 (5-24VDC IN (Vcc)) IS FOR CUSTOMER SUPPLIED POWER TO OPERATE RXTX.





ENCODER POWER SUPPLY

FEATURES

A clean source of dedicated power for your encoder is an important factor when designing a reliable system. Now available from EPC are small, easily mounted DIN Rail power supplies specifically chosen to power encoders. Designed for space efficiency, these compact power supplies are available in 5, 12, or 24 VDC.

Easy to see LED indicators show the power supply is working properly. Screw type terminals easily accommodate wires from AWG 24 to 14 while snap-on DIN-Rail mounting (TS35/7.5 or TS35/15) allows the unit to sit safely and firmly on the rail with no tools required even to remove. The shock proof housing is both UL and CE approved. These supplies have been tested to work with all our Accu-Coders™.

SPECIFICATIONS

Electrical

Nominal Input Voltage..... 100 to 240 Vac / 47 to 63 Hz
Input Voltage Range ..... 90 to 265 Vac / 47 to 63 Hz or
120 to 370 VDC
Frequency ..... 100 kHz min
Inrush Surge Current..... < 10 A @ 115Vac, < 18A @ 230 Vac
Input Fuse ..... T2A / 250 Vac

	EPS-5V	EPS-12V	EPS-24V
Nominal Output Voltage	5 VDC	12 VDC	24 VDC
Tolerance	± 1 %	± 1 %	± 1 %
Nominal Output Current	3 A	1.5 A	0.75 A
Efficiency	> 75%	> 77 %	> 77 %
Ripple and Noise	50 mV	50 mV	50 mV

Mechanical

Dimensions ..... 3.54" L x 0.89" W x 4.5" D
(90 mm L x 22.5 mm W x 115 mm D)
Connection Type ..... Screw Clamp Connection
Mounting ..... DIN-Rail TS35/7.5 or TS35/15

Environmental

Operating Temperature-10O C to +50O C
Storage Temperature ..... -25O C to +85O C
Relative Humidity..... 95% RH

ENCODER POWER SUPPLY ORDERING INFORMATION

(Specify stock # when ordering)
Differential = A,A', B,B', Z,Z'
Single Ended = A, B, Z

Stock #
100043.....5V Output (EPS-5V)
100044.....12V Output (EPS-12V)
100045.....24V Output (EPS-24V)

Approvals and Standards

UL/cUL...UL 508 / UL 1310 Listed, Class 2
TUV.....EN 60950
CE .....EN 50081-1 / EN 55022 Class B,
EN 61000-3-2
EN 61000-3-3, EN 50082-1 / EN 55024
FCC .....Class B

PROGRAMMABLE ENCODER ACCESSORIES

USB PROGRAMMING KIT

Kit includes software, USB Programming Module, and 2-meter Interface Cable with specified connector. See Accessories for individual Interface Cables.

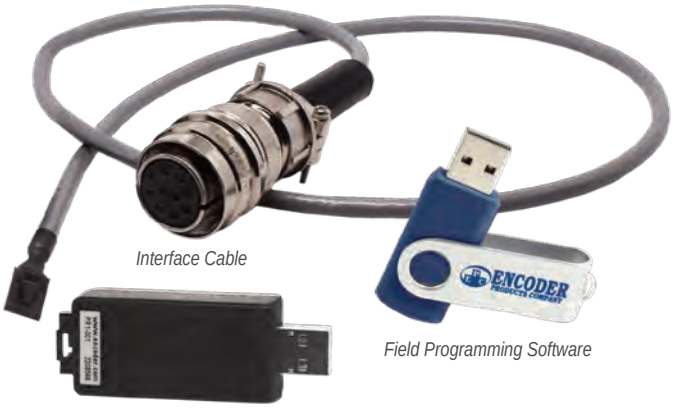
PR1-001-10..... 10-Pin MS Style Programming Kit
PR1-001-07..... 7-Pin MS Style Programming Kit
PR1-001-06..... 6-Pin MS Style Programming Kit
PR1-001-J ..... 5-Pin M12 Programming Kit
PR1-001-K..... 8-Pin M12 Programming Kit
PR1-001-09..... 9-Pin D-Sub Programming Kit
PR1-001-G ..... Gland Cable Programming Kit

USB PROGRAMMING MODULE

PR1-001..... USB Programming Module

PROGRAMMING INTERFACE CABLE (2 METER)

075233-02..... 10-Pin MS Style Interface Cable
075234-02..... 7-Pin MS Style Interface Cable
075235-02..... 6-Pin MS Style Interface Cable
075236-02..... 5-Pin M12 Interface Cable
075237-02..... 8-Pin M12 Interface Cable
075238-02..... 9-Pin D-Sub Interface Cable
075240-02..... Gland Interface Cable



Interface Cable

Field Programming Software

USB Programming Module

CONNECTORS & CABLES

MATING CONNECTORS

Stock #	Description	
080014	MS3106A14S-6S-619	6-pin MS
080174	MS3106A16S-1S-618	7-pin MS
080113	MS3106A18-1S-618	10-pin MS
080325-01	AIM 40-9709S	9-pin D-sub Miniature
080359		12-pin M23
080364		16-pin 23, CE
080365		16-pin M23
080023	KPT06F14-19S	19-pin Bayonet
080376-01		10-pin Industrial Clamp
080021	KPT06F12-10S	10-pin Bayonet

ELECTRICAL CABLE

Stock #	Description
070148	Standard Cable
070244	Twisted Pair Cable - Line Driver outputs only
070063	High Temperature Cable
070264	Cable for Absolute Encoders - Models 925 and 958

PRE-WIRED CABLE AND MATING CONNECTOR ASSEMBLIES

To order a pre-wired cable and connector assembly complete the boxes to indicate the connector style, cable length, and output configuration.

INCREMENTAL ENCODER CABLE ASSEMBLIES
(Cable is 24 AWG foil and braid shielded and is rated to 105° C)

□□□ C - □□□ - □□ - □ - □

- CABLE TYPE: 3 Standard; 4 Twisted Pair
- CONNECTOR TYPE: 06 6-pin MS[1]; 07 7-pin MS[1]; 09 9-pin D-Sub Mini[1]; 10 10-pin MS; 12 12-pin M23; A6 6-Pin MS 90°; A7 7-pin MS 90°; A1 10-pin MS 90°; H1 10-pin Bayonet
- CABLE LENGTH: Number of Feet
- OUTPUT TYPE: ST OC, PU, PP, S, O; HV HV
- CHANNEL CONFIGURATION: A Single Channel; Q Quadrature or Dual Channel; R Quadrature with Index Z
- CE COMPATIBLE: Y Yes; N No

ABSOLUTE ENCODER CABLE ASSEMBLIES
(Cable is 28 or 30 AWG foil and braid shielded and is rated to 70° C)

□□□ C - □□□ - □

- CABLE TYPE: 5 Absolute; 4 Twisted Pair
- CONNECTOR TYPE: 10 10-pin MS[2]; 16 16-pin M23[3]; 19 19-pin Bayonet
- CABLE LENGTH: Number of Feet
- CE COMPATIBLE: Y Yes; N No

Notes:
1 Available with standard cable (3XX) only.
2 8 bit only. CE option not available.
3 For use with ≤ 12 bit outputs.

MOLEX HEADER CORDSETS for use with Model 30M

Stock #	Description	Length
075230	8-pin Molex Mating Connector	24 inches
075232	16-pin Molex Mating Connector	24 inches

M12 (12 MM) CORDSETS (Always use a shielded cordset)

8-CONDUCTOR CORDSETS (FOR USE WITH 8-PIN M12 CONNECTORS)

Shield not connected to Coupling Nut

Stock #	Description	Length
075100	RKC8T-0.5/S618	0.5 Meters (1.64 ft)
075101	RKC 8T-2/S618	2 Meters (6.56 ft)
075102	RKC 8T-4/S618	4 Meters (13.12 ft)
075103	RKC 8T-6/S618	6 Meters (19.69 ft.)
075104	RKC 8T-10/S618	10 Meters (32.81 ft)

Shield connected to Coupling Nut (use for CE option)

Stock #	Description	Length
075200	RKS 8T-2	2 Meters (6.56 ft)
075201	RKS 8T-4	4 Meters (13.12 ft)
075202	RKS 8T-6	6 Meters (19.69 ft)
075203	RKS 8T-10	10 Meters (32.81 ft)

3, 4, AND 5-CONDUCTOR CORDSETS (FOR USE WITH 5-PIN M12 CONNECTORS)

Shield not connected to Coupling Nut

Stock #	Description	Length
075205	3-Conductor RK 4T-1/S618	1 Meter (3.28 ft)
075206	4-Conductor RK 4.4T-1/S618	1 Meter (3.28 ft)
075204	5-Conductor RK 4.5T-1/S618	1 Meter (3.28 ft)

Shield connected to Coupling Nut (use for CE option)

Stock #	Description	Length
075211	5-Conductor	1 Meter (3.28 ft)

CONNECTORS & CABLES

POWER AND COMMUNICATION CABLES FOR ETHERNET ENCODERS

Stock #	Description	Length
075241	DC Power Cable, A Code	2 M
075242	DC Power Cable, A Code	5 M
075243	DC Power Cable, A Code	10 M
075244	DC Power Cable, A Code	20 M
075245	Signal Cable, D Code, M12 4-pin to RJ-45	2 M
075246	Signal Cable, D Code, M12 4-pin to RJ-45	5 M
075247	Signal Cable, D Code, M12 4-pin to RJ-45	10 M
075248	Signal Cable, D Code, M12 4-pin to RJ-45	20 M
075249	Signal Cable, D Code, M12 4-pin to M12 4-pin	2 M
075250	Signal Cable, D Code, M12 4-pin to M12 4-pin	5 M
075251	Signal Cable, D Code, M12 4-pin to M12 4-pin	10 M
075252	Signal Cable, D Code, M12 4-pin to M12 4-pin	20 M

BORE & SHAFT ACCESSORIES

BORE ADAPTORS

INDIVIDUAL BORE ADAPTORS

Stock #	Description
176252	1.000" ID Bore Adaptor for Model 25T
176253	7/8" ID Bore Adaptor for Model 25T
176254	5/8" ID Bore Adaptor for Model 25T
176255	25 mm ID Bore Adaptor for Model 25T
176256	24 mm ID Bore Adaptor for Model 25T
176257	20 mm ID Bore Adaptor for Model 25T
176258	19 mm ID Bore Adaptor for Model 25T
176277	3/4" ID Bore Adaptor for Model 25T
176283	1/2" ID Bore Adaptor for Model 25T
176313	14 mm ID Bore Adaptor for Model 25T
176315	15 mm ID Bore Adaptor for Model 25T
176325	12 mm ID Bore Adaptor for Model 25T
176328	1/4" ID Bore Adaptor for Model 25T
176329	6 mm ID Bore Adaptor for Model 25T
176335	8 mm ID Bore Adaptor for Model 25T
176336	10 mm ID Bore Adaptor for Model 25T
176337	11 mm ID Bore Adaptor for Model 25T
176338	5/16" ID Bore Adaptor for Model 25T
176339	3/8" ID Bore Adaptor for Model 25T

Various Bore Adaptors

BORE ADAPTOR KITS

Stock#	Description
260-BK97	Small Metric Bore Adaptor Kit for 260. Includes 6, 8, & 10 mm
260-BK98	Large Metric Bore Adaptor Kit for 260. Includes 11, 12, & 14 mm
260-BK99	Inch Standard Bore Adaptor Kit for 260. Includes 0.250", 0.375 and 0.500"
25T-BK98	Metric Bore Adaptor Kit for 25T. Includes 19, 20, 24, 25 & 28 mm
25T-BK99	Inch Standard Bore Adaptor Kit for 25T. Includes 0.500", 0.625" 0.750", 0.875" and 1.000"
58T-BK98	Metric Bore Adaptor Kit for 58T. Includes 6, 8, 10, 11, 12 & 14 mm
58T-BK99	Inch Standard Bore Adaptor Kit for 58T. Includes 0.250", 0.3125" 0.375" and 0.500"

ACCESSORIES FOR MAGNETIC ENCODER MODULES

OVER SHAFT MAGNET HOLDERS

Stock#	Description
176596-01	3/16" Bore ID
176597-01	5mm Bore ID
176598-01	6mm Bore ID
176599-01	1/4" Bore ID
176600-01	5/16" Bore ID
176601-01	8mm Bore ID
176602-01	3/8" Bore ID
176603-01	10mm Bore ID
176604-01	1/2" Bore ID
176605-01	14mm Bore ID
176606-01	5/8" Bore ID

Over Shaft Magnet Holder

MAGNET

Stock#	Description
030141	Raw Magnet

PRESS IN/ON MAGNET HOLDER

Stock#	Description
176607-01	Press In/On Magnet Holder (0.250" bore/0.125" shaft)

Press In/On Magnet Holder

FIELD REPLACEABLE SEALS

Stock #	Description
161247	Field Replaceable IP66 seal for 725, 925, IND12 & TR3
161248	Field Replaceable IP67 seal for 725, 925, TR3
161254	Field Replaceable IP67 seal for 702, 802, 758, 858
161264	Field Replaceable IP66 seal for 702, 802, 758, 858

SHAFTS

Tapered Shafts

Stock #	Description
176406	10:1 Tapered Shaft with Internal Threads
176407	10:1 Tapered Shaft without Internal Threads
176154-01	Model TR1 Replacement Pivot Shaft Kit, 1/4-20 Threaded
176155-01	Model TR1 Replacement Pivot Shaft Kit, M6 Threaded
176224-01	Model TR1 Torsion Spring Assembly

SHAFT COUPLINGS

Stock #	Length	From shaft size	To shaft size
161307	1.00"	0.250"	0.250"
161308	1.00"	6 mm	6 mm
161309	1.00"	6 mm	0.250"
161314	1.00"	6 mm	0.375"
161313	1.00"	0.250"	0.375"
161317	1.00"	0.375"	0.375"
161319	1.50"	0.375"	0.500"

Flexible Shaft Couplings

MAGNETIC COUPLINGS

Stock #	Description
176282-01	For Models 260 & 25T with a 5/8"(0.625") bore
176409-01	For Models 260 & 25T with a 3/8" (0.375") bore

Magnetic Couplings

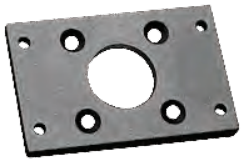
MOUNTING BRACKETS & OPTIONS

MOUNTING BRACKETS

Pivot Brackets

Stock #	
176430-01 (Replaces 140039)	Single Pivot for Cube Housing*
176430-02	Spring Loaded Single Pivot for Cube Housing*
176431-01 (Replaces 140040)	Double Pivot for Cube Housing*
176431-02	Spring Loaded Double Pivot for Cube Housing*
176727-01	Single Pivot Bracket for Size 25 Shaft Encoders*
176727-02	Spring Loaded Single Pivot Bracket for Size 25 Shaft Encoders*
140113	Spring Loaded Pivot Mounting Bracket for 702, 725, and 925

**Mounting bracket included.*



Heavy Duty Mounting Plate
#176396-01

Tru-Trac™ Optional Mounting Brackets

Stock #	
140104	Angled Mounting Bracket for Models TR1 Tru-Trac™ and TR2 Tru-Trac™
176389-01	Mounting Plate and Pivot Arm Kit for Model TR3 Tru-Trac™
176391-01	Double Pivot Bracket Kit for Model TR3 Tru-Trac™

Foot Mount Bracket
#140122

LCE Optional Mounting Plate

Stock #	
176064-01	Attaches to Standard or Industrial LCE in three different orientations

Foot Mounting Plates & Brackets

Stock #	
140121	Use with Clamping Flange 20 Type - 758, 858, 958
140122	For Use with 702, 802S, 725 & 925
176396-01	Heavy Duty Mounting Plate Kit for HD Cube Housing

Uni-Brackets

Adapts the Model 260 or Model 702 Flex-Mount to fit a standard motor mount with a mounting bolt circle up to 5.875", such as a NEMA 4.5" AK mount or IEC equivalent.

Stock #	
175997-01	Uni-Bracket Kit

Three Point Anti-Rotation Flex Mount
#140114-01

MOUNTING OPTIONS

Anti-Rotation Flex Mounts

Stock #	
140054-01	775, 776, Anti- Rotation Flex Arm Mounting Kit.
140106-01	225 Flex Arm Mounting Kit
140108-01	260 and 702 Flex Arm Mounting Kit
140055-01	260 SF Mounting Kit
140107-01	260 SD Mounting Kit
140071-01	260 FA Flex Arm Mounting Kit
140114-01	25T SE 3-Point Mount Kit
140115-01	25T SG Tether Arm Kit
140116-01	25T SJ Tether Arm Kit
140123-01	25T SH Tether Arm Kit

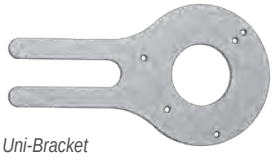
Angled Mounting Bracket
#140104

Mounting Hubs with Couplings for Size 15

Stock #	
175488-01	NEMA Size 34, 6 mm coupling
175489-01	NEMA Size 23, 6 mm coupling
175488-02	NEMA Size 34, 1/4" coupling
175489-02	NEMA Size 23, 1/4" coupling
175488-03	NEMA Size 34, 3/8" coupling
175489-03	NEMA Size 23, 3/8" coupling

Mounting Flanges and Adaptors

Stock #	
175124	Square Flange Adaptor for Model 755A
175125	Adapts Standard Cube Housing to fit in Explosion Proof Housing
175126	Standard Cube Universal Round Flange
175494	5PY Adaptor for Size 25 Series
175443	5PY Adaptor for 2.25" Standard Cube Housing
175557-01	Cube Mounting Adaptor for Size 20 Series
176672	Universal Mounting Adaptor for the Model 30MT



Uni-Bracket
#175997-01

MOTOR KITS/COVERS/GASKET KITS

MOTOR KITS

Model 25T Encoder with 5-28 VDC Input, A/B/Z Line Driver Outputs, 10-pin MS Style connector, -20° to 105° C Temp, IP66 Sealing, SG Tether Arm Kit, 10-pin MS Mating Connector, and 56C Protective Cover.

MK-56C-25T-001	5/8" Bore 1024 CPR
MK-56C-25T-002	5/8" Bore 2048 CPR
MK-56C-25T-003	5/8" Bore 4096 CPR
MK-56C-25T-004	1.0" Bore 1024 CPR
MK-56C-25T-005	1.0" Bore 2048 CPR
MK-56C-25T-006	1.0" Bore 4096 CPR

Model 25T Encoder with 5-28 VDC Input, A/B/Z Line Driver Outputs, 10-pin Bayonet connector, -20° to 105° C Temp, IP66 Sealing, SG Tether Arm Kit, 10-pin Bayonet Mating Connector and 56C Protective Cover.

MK-56C-25T-051	5/8" Bore 1024 CPR
MK-56C-25T-052	5/8" Bore 2048 CPR
MK-56C-25T-053	5/8" Bore 4096 CPR
MK-56C-25T-054	1.0" Bore 1024 CPR
MK-56C-25T-055	1.0" Bore 2048 CPR
MK-56C-25T-056	1.0" Bore 4096 CPR

Motor Kit for Model 25T

PROTECTIVE COVERS

Stock #	
175996-01	Uni-Cover Kit (includes bolts and washers). Compatible with Models 121, 225, 260, 755A, 702, 775, 776, and 960
770-000-02	770 Protective Cover Kit (includes mounting hardware, IP65 Sealing)
771-000-07	771 Protective Cover Kit (includes mounting hardware, IP65 Sealing)
865-000-02	865T Protective Cover Kit (includes mounting hardware, IP65 Sealing)
176301-01	56C Cage Style Cover Kit for Model 25T and Model 260 (includes bolts and washers)

Uni-Cover #175996

C-FACE GASKET KITS FOR MODELS 770 AND 771

Stock #	
770-Gasket-Kit	C-Face Gasket Kit for Model 770
771-Gasket-Kit	C-Face Gasket Kit for Model 771
121-Seal-Kit	121 Base Dust Seal (IP50)

770 Protective Cover #770-000-02

771 Protective Cover #771-000-07

TRU–TRAC™ & LINEAR ENCODER ACCESSORIES

LINEAR CABLE ACCESSORIES

50" Linear Cable Adaptor for standard or industrial cube housings. Mounting hardware is included for easy installation directly over the shaft of your existing cube encoder. See *Technical Bulletin TB-517* for specific installation instructions.

Stock #	
LCA01	50" Linear Cable Adaptor for Standard Cube Housing with 1/4" shaft
LCA02	50" Linear Cable Adaptor for Industrial Cube Housing with 3/8" shaft
176064-01	Optional Mounting Plate and hardware for cube style Linear Cable Encoders

LCE Linear Cable Adaptor #LCA01

TR2 RACKS & ACCESSORIES

Stock #	
140104	Angle Mounting Bracket
176216	12" for Stainless Steel
176217	24" for Stainless Steel
176218	36" for Stainless Steel
176219	Spacer Block for Stainless Steel
161546	2 meter Flexible Rack
161548	Flexible Rack Clamps 10 pk (with M4 x 0.7 x 1 mm) Phillips Pan Head Machine Screws
161547	1 meter Guide Rail for Flexible Rack (does not work with 176220 gear)
176220	40 Tooth Pinion Gear for use with Stainless Steel Rack
176302	40 Tooth Pinion Gear for use with Flexible Rack

Pinion Gears for TR2 Tru-Trac™ stainless steel rack #176220

For lengths over 36", order multiple pieces of rack or the flexible plastic option. A spacer block must be used to accurately join two or more pieces of rack. At encoder.com, see Technical Bulletins *TB-522: TR2 – Tru-Trac™ Installation Instructions* or *TB-523: TR2 – Tru-Trac™ Flexible Rack Installation Instructions for details.*

TR2 Tru-Trac™ flexible rack, #161546.

BRACKETS WITH MEASURING WHEELS

For most linear measurement applications, our line of Tru-Trac™ encoders are a great option (see pages 26 – 35). These integrated linear measurement solutions are easy to install and deliver reliable, accurate feedback for applications such as cut-to-length, spooling, length measurement, and print registration. Occasionally, though, there is a linear measurement application that requires something our Tru-Trac™ encoders don't offer. Maybe you need absolute feedback. Maybe you need additional bearing load. Maybe you need the encoder to be programmable. If your application calls for any of those options, we have another solution: a bracket that turns a Size 25 shaft encoder into a linear measurement solution.

Get Absolute Feedback

Our new bracket is specifically designed to fit our Size 25 shaft encoders, and that includes our absolute Model A25SB (see page 20), a multi-turn absolute encoder. The Model A25SB is ideal for industrial applications that require an encoder with the capability of absolute positioning output, even in power-off scenarios. Offering either SSI or CANopen communication protocols, the Model A25SB features absolute feedback with resolution up to 16 bits single turn and 43 bits multi-turn.

Need Additional Bearing Load?

For applications requiring additional bearing load, the Model 725I Accu-Coder™ (see page 97) features an extra-heavy-duty industrial housing. In addition to the rated bearing load of 80 lbs, the fully isolated encoder-within-an-encoder design provides an additional layer of protection by using an internal flexible mount and independent set of bearings to further protect the encoder from the effects of severe axial and radial shaft loading.

Single Pivot Bracket for Size 25 Shaft Encoders: #176727-01
Spring-Loaded Single Pivot Bracket for Size 25 Shaft Encoders: #176727-02
Mounting bracket is included with both options.
Also available as a kit with a Model 25SP programmable encoder. Call our Sales Department for more information.

Program Your Encoder for Your Application

If you need resolutions beyond 10,000 CPR, the programmable Model 25SP Accu-CoderPro™ is your answer (see page 88). Like the Model 725I, this shaft encoder is also designed for the challenges of an industrial environment and offers the same variety of shaft sizes, a range of connectors, and sealing up to IP67. However, the Model 25SP offers programmable output type, waveform, and resolution. There are 6 output options, 32 waveforms to choose from, and you can choose any resolution from 1 to 65,536 CPR – that's 262,144 counts using 4x quadrature counting. The Model 25SP Accu-CoderPro™ comes standard with dual bearings rated 80 lbs axial or radial, and offers up to IP67 sealing. Some configurations are in stock and ready to ship.

Two Options for Your Bracket

Both types of bracket allow for convenient mounting of an encoder and measuring wheel over the surface being measured, and both allow the assembly to adjust pitch for variations in material height.

The Single Pivot Bracket is gravity loaded and uses the combined weight of the encoder, measuring wheel, and bracket to provide surface torsion.

The Spring Loaded Single Pivot Bracket uses a spring-loaded bracket, which provides an adjustable surface torsion. This allows the encoder and measuring wheel to be mounted in almost any orientation, even upside down.

For more information on choosing the right measuring wheel, see page 35. If you're which linear measurement solution is right for your application, give us a call. When you call EPC, you talk to real engineers and encoder experts who can help you specify the right encoder solution for your application.

MEASURING WHEELS

LINEAR MEASURING WHEELS

Faced Measuring Wheels

Stock #	Circumference	Rim Type	Bore	Width
161428 (TR3)	12"	60 Polyurethane	3/8"	0.75"
161442 (TR3)	300 mm	60 Polyurethane	3/8"	0.75"
161336	12"	80 Polyurethane	1/4"	0.70"
161337	12"	80 Polyurethane	3/8"	0.70"
161360 (TR1)	6"	85 Polyurethane	1/4"	0.25"
161399 (TR1)	200 mm	85 Polyurethane	1/4"	0.25"
161338	12"	90 Polyurethane	1/4"	0.70"
161339	12"	90 Polyurethane	3/8"	0.70"
161349	12"	90 Polyurethane	5/8"	0.70"
161370	6"	Knurled	1/4"	0.4"
161376	6"	Knurled	3/8"	0.4"
161401 (TR1)	6"	Knurled	1/4"	0.25"
161332	12"	Knurled	1/4"	1"
161333	12"	Knurled	3/8"	1"
161362	12"	Knurled	1/4"	0.4"
161379	12"	Knurled	3/8"	0.4"
161432 (TR3)	12"	Knurled	3/8"	0.75"
161361	1/3 Meter	Knurled	1/4"	10 mm
161380	1/3 Meter	Knurled	3/8"	10 mm
161371	200 mm	Knurled	1/4"	10 mm
161400 (TR1)	200 mm	Knurled	1/4"	0.25"
161424 (TR1)	200 mm	Knurled	1/4"	0.25"
161372	300 mm	Knurled	1/4"	10 mm
161377	300 mm	Knurled	3/8"	10 mm
161443 (TR3)	300 mm	Knurled	3/8"	0.75"
161373	400 mm	Knurled	1/4"	10 mm
161378	400 mm	Knurled	3/8"	10 mm
161374	500 mm	Knurled	1/4"	20 mm
161381	500 mm	Knurled	3/8"	20 mm
161423 (TR1)	6"	Knurled Hard Anodized	1/4"	0.25"
161419	12"	Knurled Hard Anodized	3/8"	0.4"
161436 (TR3)	12"	Knurled Hard Anodized	3/8"	0.75"
161438 (TR3)	300 mm	Knurled Hard Anodized	3/8"	0.75"
161420	12"	Knurled Hard Anodized	3/8"	1"
161310	12"	65 Polyurethane	1/4"	1"
161331	12"	65 Polyurethane	3/8"	1"
161346	12"	65 Polyurethane	1/4"	1/2"
161347	12"	65 Polyurethane	3/8"	1/2"
161344	1/3 Meter	65 Polyurethane	1/4"	5/8"
161359	1/3 Meter	65 Polyurethane	3/8"	5/8"

Rubber Insert Measuring Wheels

Stock #	Circumference	# of Inserts	Bore	Width
161363	200 mm	1	1/4"	10 mm
161382	200 mm	1	3/8"	10 mm
161364	300 mm	1	1/4"	10 mm
161384	300 mm	1	3/8"	10 mm
161365	400 mm	1	1/4"	10 mm
161385	400 mm	1	3/8"	10 mm
161366	500 mm	2	1/4"	20 mm
161388	500 mm	2	3/8"	20 mm
161369	1/3 Meter	1	1/4"	10 mm
161387	1/3 Meter	1	3/8"	10 mm
161367	6"	1	1/4"	10 mm
161383	6"	1	3/8"	10 mm
161368	12"	1	1/4"	10 mm
161386	12"	1	3/8"	10 mm

For more inofrmation on how to choose the right measuring wheel for your application, see page 35.

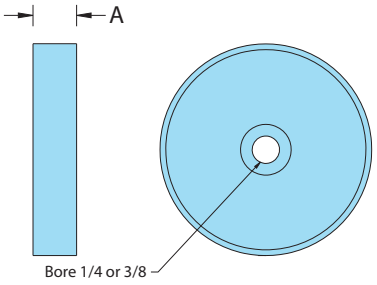
Measuring Wheel Dimensions

Rim Facing	Circumference	(A) Rim Width
Knurled	12"	1"
Rubber	12"	1"
80 Polyurethane	12"	0.70"
90 Polyurethane	12"	0.70"
Rubber	12"	1/2"
Knurled	1/3 meter	5/8" or 1"
Rubber	1/3 meter	5/8" or 1"
Urethane	1/3 meter	1"

Temperature Specifications

Rubber Faced	Urethane Faced
-40° F to +275° F	-40° F to +155° F

*90 polyurethane is a more durable material and performs better for tracking rough or hard fibers than the slightly softer 80 polyurethane material. The above recommendations are only guidelines. Performance may vary depending on your application. Contact Customer Service for specification assistance.



Typical Measuring Wheel

Recommended Use for Measuring Wheels

KNURLED FACED
- Course Fabric
- Cloth Tape
- Rough Wood
- Rubber
- Carpet
- Foam
- Insulation

80 POLYURETHANE FACED*
- Soft Materials
- Smooth Materials

90 POLYURETHANE FACED
- Cardboard
- Matting
- Sandpaper
- Insulated Wire
- Metal

RUBBER INSERT
- Fine Fabric
- Paper
- Cable
- Hard Plastic
- Film
- Foil
- Metal (cease-free)

BRACKETS WITH MEASURING WHEELS

For most linear measurement applications, our line of Tru-Trac™ encoders are a great option (see pages 26 – 35), but sometimes using a Cube Encoder (see pages 70 – 77) with a bracket is the better choice. If you need help determining the best linear measurement solution for your application, give us a call. When you call EPC, you talk to real engineers and encoder experts who understand how encoders work, and can help you specify the right encoder solution for your application.

Single Pivot Bracket or Spring Loaded Single Pivot Bracket

The Single Pivot Bracket allows for convenient mounting of an encoder and measuring wheel over the surface being measured.

With the Single Pivot Bracket, the gravity-loaded bracket uses the combined weight of the encoder, measuring wheel, and bracket to provide surface torsion, while the single pivot action allows the assembly to adjust pitch for variations in material height.

The Spring Loaded Bracket provides an adjustable surface torsion, which allows the encoder and measuring wheel to be mounted in almost any orientation, even upside down.

For use with Standard and Industrial Cube housing options with single- or double-ended shafts. Right angle bracket and 5/8" diameter bar also included

Single Pivot Bracket Stock #176389-01

Spring Loaded Single Pivot Bracket Stock #176389-01

Spring Loaded Single Pivot Bracket

Double Pivot Bracket or Double Loaded Single Pivot Bracket

The Double Pivot Bracket allows for convenient mounting of an encoder and measuring wheel over the surface being measured.

With the Double Pivot Bracket, gravity loaded bracket uses the combined weight of the encoder, measuring wheel and bracket to provide surface torsion, while the double pivot action allows the assembly to adjust both pitch and roll for variations in the surface being measured.

The Spring Loaded Double Pivot Bracket provides an adjustable surface torsion, which allows the encoder and measuring wheel to be mounted in almost any orientation, even upside down.

For use with Standard and Industrial Cube housing options with double-ended shafts. Right angle bracket and 5/8" diameter bar also included

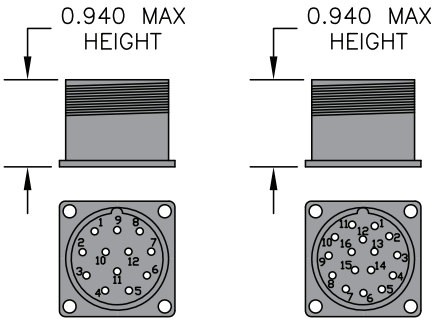
Double Pivot Bracket Stock #176431-01

Double Loaded Single Pivot Bracket Stock #176389-01

Double Pivot Bracket without spring

CONNECTOR PIN CONFIGURATION DIAGRAMS

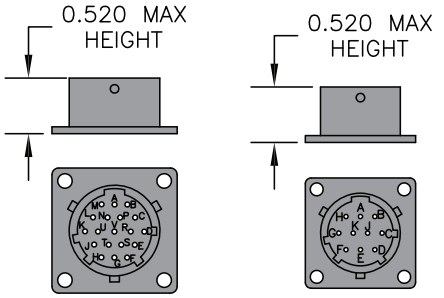
M23 STYLE CONNECTORS



12-Pin M23

16-Pin M23

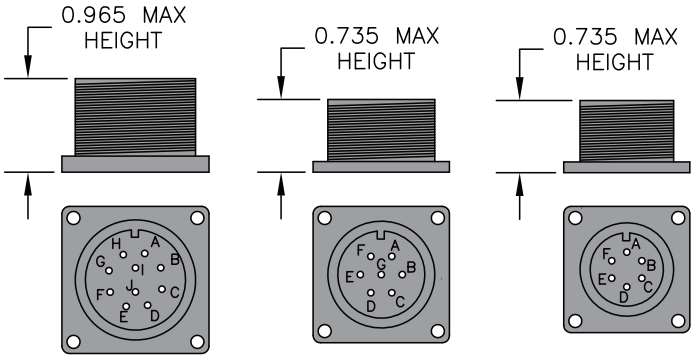
BAYONET STYLE CONNECTORS



19-Pin Bayonet

10-Pin Bayonet

MS STYLE CONNECTORS

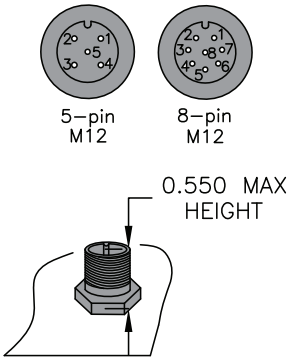


10-Pin MS

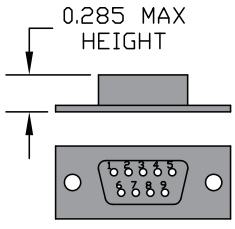
7-Pin MS

6-Pin MS

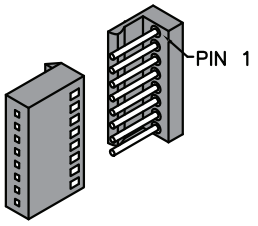
M12 STYLE CONNECTORS



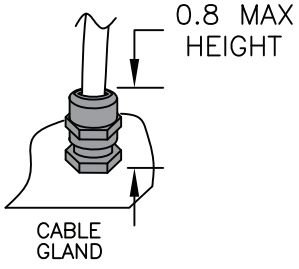
9-PIN D-SUB



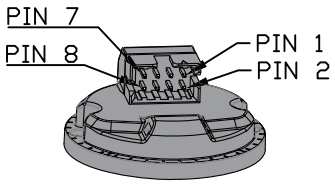
8-PIN MOLEX HEADER



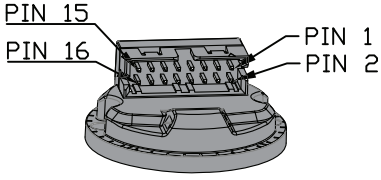
CABLE GLAND



8-PIN MOLEX HEADER FOR THE 30M



16-PIN MOLEX HEADER FOR THE 30M



QUADRATURE PHASING AND INDEX GATING OPTIONS

Standard Quadrature Phasing -
A leads B during clockwise rotation when viewed from the shaft end or mounting face.

If your model is...	And your output type is...	And you need...	For number of channels enter...	For waveform see...
15, 25, 121, 260, TR1, TR2, TR3	OC, PU, HV, OD, LO, PP	Single channel only	A	Figure 1
		Quadrature A and B	Q	Figure 2
		Quadrature A and B with 180° index gated to A	R	Figure 3
		Quadrature A and B with 90° index gated to A and B	R3	Figure 4
		Quadrature A and B with inverted 180° index gated to A	R5	Figure 5
		Quadrature A and B with inverted 90° index gated to A and B	R7	Figure 6
755A, 702, 725, 758, 802S, 858S	HV, PP	Quadrature A and B with 180° index gated to A	R	Figure 3
		Quadrature A and B with 180° index gated to B	R2	Figure 7
		Quadrature A and B with 90° index gated to A and B	R3	Figure 4
		Quadrature A and B with ungated index centered on A between 360° and 180°	R4	Figure 8
		Quadrature A and B with inverted 180° index gated to A	R5	Figure 5
		Quadrature A and B with inverted 180° index gated to B	R6	Figure 9
		Quadrature A and B with inverted 90° index gated to A and B	R7	Figure 6
		Quadrature A and B with ungated inverted index centered on A between 360° and 180°	R8	Figure 10
755A, 702, 725, 758, 802S, 858S	OC, PU *Note: Interpolated units CPR>3000 will use HV/PP waveforms.*	Quadrature A and B with ungated index centered on A low between 360° and 180°	R	Figure 11
		Quadrature A and B with 180° index gated to B low	R2	Figure 12
		Quadrature A and B with 90° index gated to A low and B low	R3	Figure 13
		Quadrature A and B with ungated index centered on A low between 360° and 180°	R4	Figure 14
		Quadrature A and B with inverted 180° index gated to A low	R5	Figure 15
		Quadrature A and B with inverted 180° index gated to B low	R6	Figure 16
		Quadrature A and B with inverted 90° index gated to A low and B low	R7	Figure 17
		Quadrature A and B with ungated inverted index centered on A low between 360° and 180°	R8	Figure 18
770, 771, 775, 776, 865T	HV, PP	Quadrature A and B	Q	Figure 2
		Quadrature A and B with 180° index gated to A	R	Figure 3
		Quadrature A and B with 90° index gated to A and B	R3	Figure 4
		Quadrature A and B with inverted 180° index gated to A	R5	Figure 5
		Quadrature A and B with inverted 90° index gated to A and B	R7	Figure 6
770, 771, 775, 776, 865T	OC, PU	Quadrature A and B	Q	Figure 2
		Quadrature A and B with ungated index centered on A low between 360° and 180°	R	Figure 11
		Quadrature A and B with 90° index gated to A low and B low	R3	Figure 13

Reverse Quadrature Phasing -
B leads A during clockwise rotation when viewed from the shaft end or mounting face.

If your model is...	And your output type is...	And you need...	For number of channels enter...	For waveform see...
15, 25, 121, 260, TR1, TR2, TR3	OC, PU, HV, OD, LO, PP	Reverse Quadrature A and B	K	Figure 19
		Reverse Quadrature A and B with 180° index gated to B low	D	Figure 20
		Reverse Quadrature A and B with 90° index gated to A low and B low	D3	Figure 21
		Reverse Quadrature A and B with inverted 180° index gated to B low	D5	Figure 22
		Reverse Quadrature A and B with inverted 90° index gated to A low and B low	D7	Figure 23
755A, 702, 725, 758, 802S, 858S	HV, PP	Reverse Quadrature A and B with 180° index gated to B low	D	Figure 20
		Reverse Quadrature A and B with 180° index gated to A low	D2	Figure 24
		Reverse Quadrature A and B with 90° index gated to A low and B low	D3	Figure 21
		Reverse Quadrature A and B with ungated index centered on B low between 360° and 180°	D4	Figure 25
		Reverse Quadrature A and B with inverted 180° index gated to B low	D5	Figure 22
		Reverse Quadrature A and B with inverted 180° index gated to A low	D6	Figure 26
		Reverse Quadrature A and B with inverted 90° index gated to A low and B low	D7	Figure 23
		Reverse Quadrature A and B with ungated inverted index centered on B low between 360° and 180°	D8	Figure 27
755A, 702, 725, 758, 802S, 858S	OC, PU *Note: Interpolated units CPR>3000 will use HV/PP waveforms.*	Reverse Quadrature A and B with ungated index centered on B low between 360° and 180°	D	Figure 28
		Reverse Quadrature A and B with 180° index gated to A low	D2	Figure 24
		Reverse Quadrature A and B with 90° index gated to A low and B low	D3	Figure 21
		Reverse Quadrature A and B with ungated index centered on B low between 360° and 180°	D4	Figure 25
		Reverse Quadrature A and B with inverted 180° index gated to B low	D5	Figure 22
		Reverse Quadrature A and B with inverted 180° index gated to A low	D6	Figure 26
		Reverse Quadrature A and B with inverted 90° index gated to A low and B low	D7	Figure 23
		Reverse Quadrature A and B with ungated inverted index centered on B low between 360° and 180°	D8	Figure 27
770, 771, 775, 776, 865T	HV, PP	Reverse Quadrature A and B	K	Figure 19
		Reverse Quadrature A and B with 180° index gated to B low	D	Figure 20
		Reverse Quadrature A and B with 90° index gated to A low and B low	D3	Figure 21
		Reverse Quadrature A and B with inverted 180° index gated to B low	D5	Figure 22
		Reverse Quadrature A and B with inverted 90° index gated to A low and B low	D7	Figure 23
770, 771, 775, 776, 865T	OC, PU	Reverse Quadrature A and B	K	Figure 19
		Reverse Quadrature A and B with 180° index gated to B low	D	Figure 20
		Reverse Quadrature A and B with 90° index gated to A low and B low	D3	Figure 21

WAVEFORM DIAGRAMS

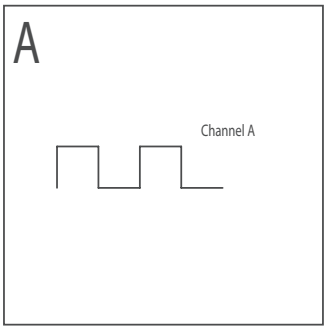


Figure 1: Single channel only

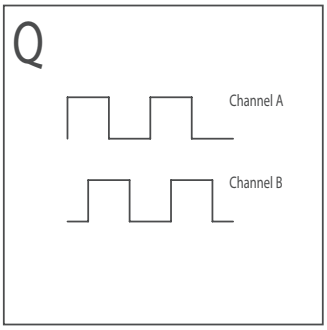


Figure 2: Quadrature A and B

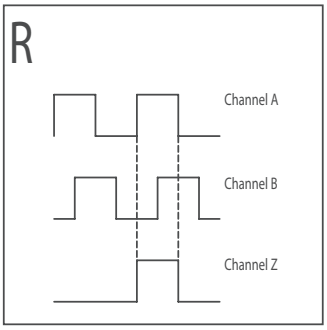


Figure 3: Quadrature A and B with 180° Index gated to A

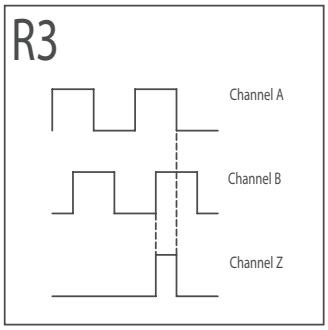


Figure 4: Quadrature A and B with 90° Index gated to A and B

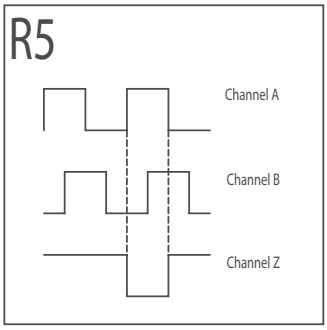


Figure 5: Quadrature A and B with inverted 180° Index gated to A

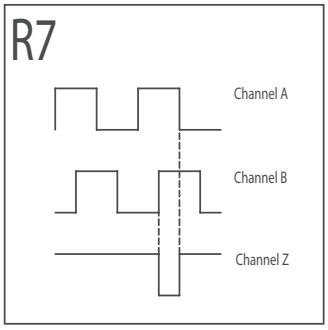


Figure 6: Quadrature A and B with inverted 90° Index gated to A and B

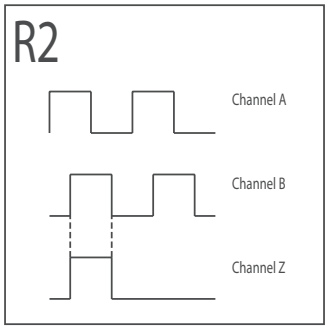


Figure 7: Quadrature A and B with 180° Index gated to B

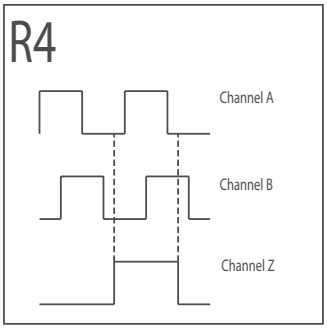


Figure 8: Quadrature A and B with ungated Index centered on A between 360° and 180°

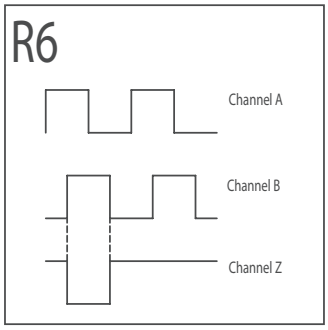


Figure 9: Quadrature A and B with inverted 180° Index gated to B

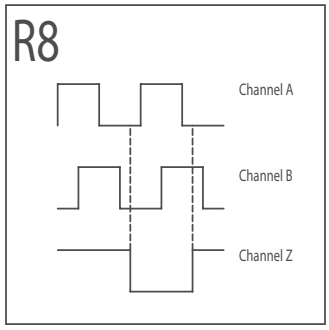


Figure 10: Quadrature A and B with ungated inverted Index centered on A between 360° and 180°

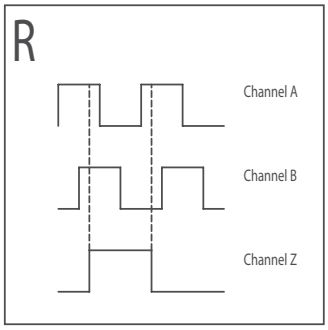


Figure 11: Quadrature A and B with ungated Index centered on A low between 360° and 180°

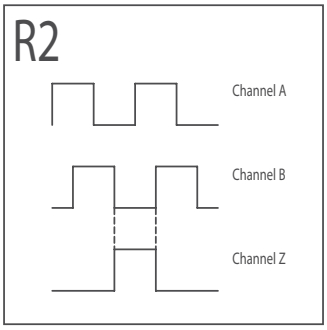


Figure 12: Quadrature A and B with 180° Index gated to B low

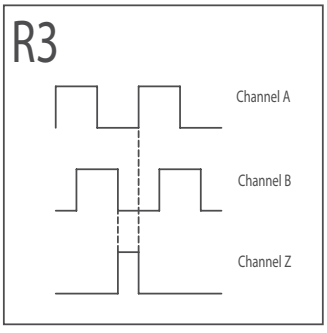


Figure 13: Quadrature A and B with 90° Index gated to A low and B low

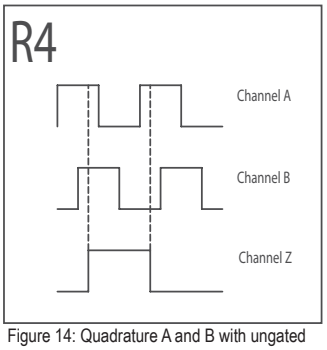


Figure 14: Quadrature A and B with ungated Index centered on A low between 360° and 180°

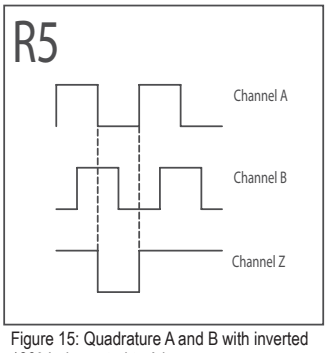


Figure 15: Quadrature A and B with inverted 180° Index gated to A low

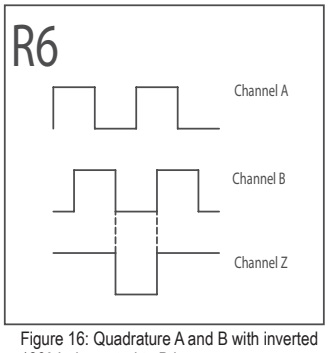


Figure 16: Quadrature A and B with inverted 180° Index gated to B low

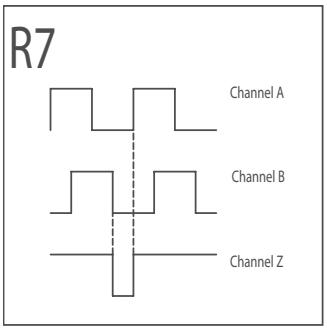


Figure 17: Quadrature A and B with inverted 90° Index gated to A low and B low

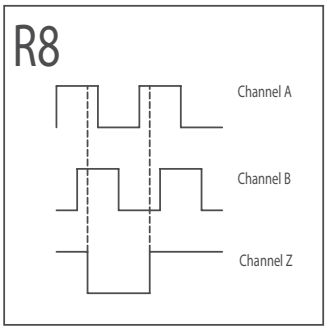


Figure 18: Quadrature A and B with ungated inverted Index centered on A low between 360° and 180°

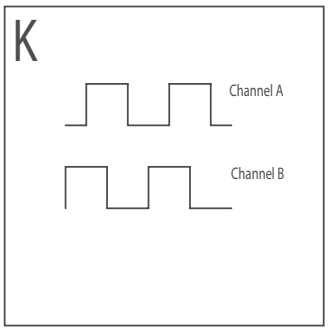


Figure 19: Reverse Quadrature A and B

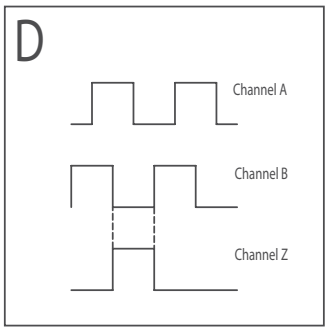


Figure 20: Reverse Quadrature A and B with 180° Index gated to B low

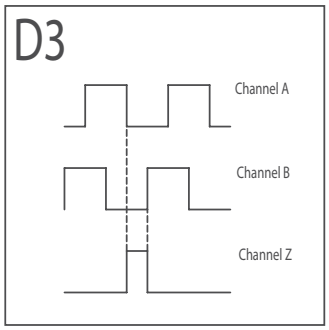


Figure 21: Reverse Quadrature A and B with 90° Index gated to A low and B low

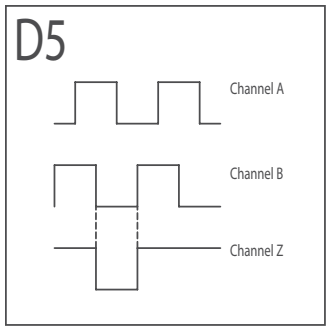


Figure 22: Reverse Quadrature A and B with inverted 180° Index gated to B low

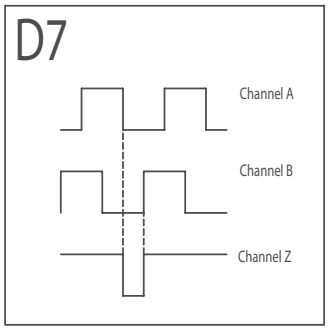


Figure 23: Reverse Quadrature A and B with inverted 90° Index gated to A low and B low

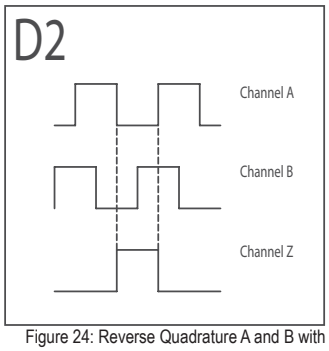


Figure 24: Reverse Quadrature A and B with 180° Index gated to A low

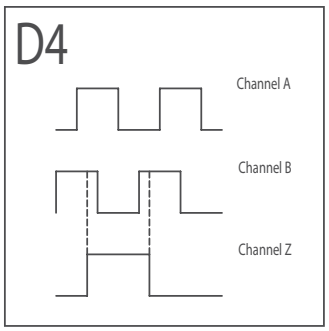


Figure 25: Reverse Quadrature A and B with ungated Index centered on B low between 360° and 180°

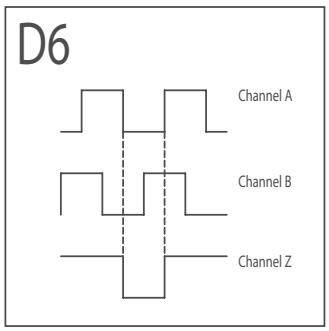


Figure 26: Reverse Quadrature A and B with inverted 180° Index gated to A low

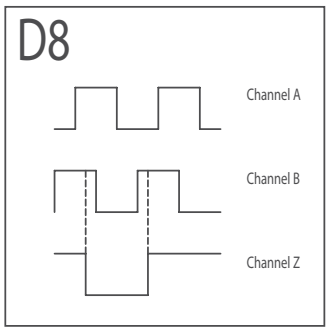


Figure 27: Reverse Quadrature A and B with ungated and inverted Index centered on B low between 360° and 180°

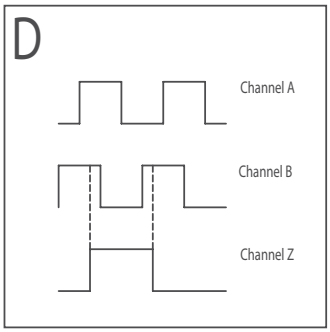


Figure 28: Reverse Quadrature A and B with ungated Index centered on B low between 360° and 180°

Call Sales & Customer Service at 800-366-5412

EPC is open for business from
8:00 am to 7:30 pm Eastern Time/ 5:00 am to 4:30 pm Pacific Time

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Standard lead time is 4 to 6 business days. Expedite Service is available upon request. Accessories are generally in stock and available for quick delivery. Contact Customer Service to confirm lead times. Single-piece orders for many of our products can ship the next business day. Contact Customer Service for details.

Expedited Service

Express and expedite services are available for most product configurations should you need a product faster than the standard lead times allows. Contact Customer Service for details.

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To change an order, ask for a Customer Service Representative. For faster service, either have your purchase order number or Encoder Products Company’s sales order number available. Service charges are assessed for some changes, including order cancellations. Contact Customer Service to determine applicable charges.

Orders will be shipped out by UPS or Federal Express. All shipments are F.O.B. factory. If you are a new OEM account or have a new OEM application, consignment or evaluation units may be available for up to 60 days. Contact Customer Service for complete details.

Part Numbering

Encoder part numbers are found on the model datasheet at encoder.com. Use the appropriate Ordering Guide for your particular model. It is important to specify the complete part number. If you are reordering, the serial number of the unit being replaced will help speed the ordering process. Ordering with incomplete information may delay product delivery. In addition, Encoder Products Company cannot assume responsibility for errors when a part number is incomplete. If you need help creating a part number, contact Customer Service. Encoder Products Company has distributors across the United States and Canada. Call 800-366-5412 and ask a Customer Service Representative for a distributor in your area.

Technical Support

Our Technical Support professionals are available to assist you in your application needs – whether it’s selecting the right encoder for your application, troubleshooting a new installation, or connecting your new encoder to your motion control system.

Encoder Products Company understands the importance of time when you have a machine down. Through our free Cross Reference and Retrofit Service, and thanks to a thorough library of specifications and dimensional information for a wide range of competitive encoders, EPC offers expert assistance for the cross-referencing and/or retrofit replacement of most domestic and foreign optical rotary encoders. In addition, serviceable replacements can often be found for encoders that use other technologies. As a final service, for those hard to find units, EPC can often suggest an alternative approach that will get you back up and running. We have provided an Expert Cross-Reference Service page on our website. It provides you with part numbers of competitors' encoders, and compares them with EPC encoders, so that you can begin the cross-referencing process.

Each Accu-Coder™ manufactured by Encoder Products Company is backed by our industry-leading three--year warranty. If you experience a problem, call our trained professionals. We can often troubleshoot a problem over the phone and determine if a repair is needed. If it’s necessary to return the encoder for repair, our technicians will perform a complete evaluation and recommend a course of action. In an emergency situation our technicians can often have your evaluation and repair completed, and ready for return shipment, within a matter of hours after receiving your encoder.

If your application calls for a solution that cannot be solved using off-the-shelf-products, EPC’s Custom Design Service may be just what you need. Call Customer Service to put our expertise to work for you.

Warranty Policy:

Products manufactured by Encoder Products Company Inc. (EPC) are warranted against defects in materials and workmanship and are warranted to meet the performance specifications as listed in the current catalog and/or data sheet for the specific product being warranted. This warranty applies to all standard catalog product configurations, with the exception of units with a rated operating temperature exceeding 85° C, for three (3) years following the date of shipment. For units with a rated operating temperature exceeding 85° C, the warranty period shall be two (2) years following the date of shipment. During that period, EPC will, at its sole option, repair or replace, at no cost to the customer, products that prove to be defective, provided the defect or failure is not due to misuse or abuse of the product. Any unauthorized attempt to repair the product(s) by the customer, or any unauthorized modifications by the customer, can, at EPC's sole option, cause this warranty to become null and void. In addition, this warranty does not apply to products that have been subjected to abuse or operated in environments that exceed their design specifications. The customer is responsible for shipment of the defective product to the EPC factory. Any warranty service (consisting of time, travel, and expenses related to such services) performed other than at EPC's factory, shall be at the customer's expense.

Limitations:

EXCEPT AS OTHERWISE STATED IN THIS WARRANTY POLICY, THERE IS NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION, WRITTEN OR ORAL, WHETHER EXPRESSED BY DESCRIPTION, DRAWING, MODEL OR SAMPLE, EITHER EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. EPC SHALL, IN NO CASE, BE LIABLE FOR DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL LOSSES OR DAMAGES, OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER. IN ANY EVENT, ANY LIABIITY SHALL BE LIMITED TO REPAIR, REPLACEMENT, OR PURCHASE PRICE REFUND, AT THE SOLE OPTION OF EPC, ONLY AFTER THE RETURN OF SUCH GOODS WITH PRIOR WRITTEN CONSENT OF EPC IN ACCORDANCE WITH THE RETURN POLICY AND WITH ALL SHIPPING CHARGES PREPAID. SOFTWARE PRODUCTS ARE SUPPLIED TO CUSTOMER SUBJECT TO CUSTOMERS ACCEPTANCE OF ALL APPLICABLE SOFTWARE LICENSES. EXCEPT AS PROVIDED HEREIN, EPC MAKES NO WARRANTY OR REPRESENTATION OF SUITABILITY, COMPATIBILITY OR PERFORMANCE OF ANY SOFTWARE PROVIDED TO CLIENT AND MAY AT ITS OPTION REPLACE OR REPAIR ANY DEFECTIVE SOFTWARE. EPC RESERVES THE RIGHT TO UPDATE, REVISE AND AMEND ALL SOFTWARE AND TECHNICAL DATA OR CONTENT AT ANY TIME. EPC SHALL HAVE NO LIABILITY OF ANY KIND OR NATURE FOR ANY TECHNICAL ERRORS OR OMISSIONS IN ANY SOFTWARE OR TECHNICAL DATA.

Return Policy

Only products currently stocked by EPC may be returned for restocking. Products that have been manufactured or configured to customer specifications are not stocked and may not be returned. Returned products are subject to a restocking fee of $25 or 25% of the purchase price, whichever is greater, and must be returned within 30 days of the date shipped from EPC.

All products being returned must be 100% complete and must be packaged in ORIGINAL PACKAGING. All packaging materials, manuals, other accessories and documentation must be included in the original packaging. In the event that a return shipment received by us is improperly packaged, altered, or physically damaged, items sent for return consideration will be denied, and EPC's return policy will not be honored. All items will be inspected and tested upon receipt.

A Return Materials Authorization (RMA) number is required for any item returned for credit. RMA numbers may be obtained by contacting Customer Service in advance. RMA numbers will be issued to original purchaser only.

Repair Services

Each Accu-Coder™ manufactured by Encoder Products Company is backed by our industry-leading three year warranty. If you experience a problem, call our trained professionals. We can often troubleshoot a problem over the phone and determine if a repair is needed. If it's necessary to return the encoder for repair, our technicians will perform a complete evaluation and recommend a course of action. In an emergency situation, our technicians can often have your evaluation and repair completed, and ready for return shipment, within a matter of hours after receiving your encoder.

SHAFT LOADING AND SEALING VS. BEARING LIFE EXPECTANCY

The mechanical life of an encoder is mainly determined by the life of the unit's bearings. Several factors affect bearing life, including shaft loading, heat, ingress, and rotational speed.

The Model 25SP Programmable Size 25 Shaft Encoder Comes standard with dual bearings rated 80lbs axial or radial. See page 88 for product details.

Shaft Loading

Shaft loading is likely the top cause of premature bearing failure. There are two types of loading to consider: radial and axial.

- Radial loading is the perpendicular force applied to the shaft. Common causes of radial loading include misalignment of the shaft when mounted or use of items such as pulley and gears.
- Axial loading is the parallel force, or force applied along the same direction of the shaft. As radial and/or axial loading increases, bearing life shortens. For this reason, the minimum amount of shaft loading or misalignment should always be the goal when installing an encoder.

One important loading fact to remember: radial shaft loading increases as a linear function the further away from the bearing the force is applied, much the same way a longer wrench gives you greater leverage against a stubborn bolt. It is always best practice to place any unavoidable radial load as close to the bearings as possible.

Heat

Heat is another factor affecting bearing. Excessive temperatures can thin out the grease in the bearings. As the grease thins, lubrication reduces and bearing wear increases.

Ingress

Ingress is the introduction of foreign matter into the bearings. Ingress of foreign matter, whether it is in liquid or solid form, is another common cause of rapid bearing failure. Ball bearings are precision devices with critical internal clearances. Anything that disturbs these clearances will shorten the life of the bearing, often quite drastically. For this reason, many encoders are available with shaft seals that help guard the unit and bearings against the ingress of foreign substances.

All of the factors discussed above, combined with the speed of rotation, work together to determine bearing life. In a worst case condition that combines high shaft loading, high heat, and excessive foreign matter with high rotational speeds, bearing life will likely not be what would be expect to be within the range of typical. An encoder subjected to the same factors at lower rotational speeds might never cause any concern with the life expectancy of the bearings.

A group of bearings

To realize the maximum life potential of an encoder, take the necessary precautions when installing the unit for proper shaft alignment, specify shaft seals (see page 137) when needed to protect from foreign materials, and do not subject the unit to any unnecessary heat.

If you still have questions about output, or anything else encoder-related, call EPC When you call EPC, you talk to engineers and encoder experts who can answer your toughest encoder questions. Call today to get the information you need.

IP RATINGS AND SEALING OPTIONS FOR EPC ENCODERS

Encoder Products Company uses the international standard IP Code, International Protection Marking, IEC standard 60529[1], for specifying the sealing qualities of our units. The chart below explains what the different numerical designations define. Note that the designations build on the previous ones; that is, an IP69K rating means that unit is also protected against everything that a unit rated IP68, IP67, IP66, etc., is protected against.

EPC encoders offer the following sealing designations on our encoders:

IP50: Unit is not entirely protected from ingress of dust, but not enough dust can enter the unit to interfere with the unit's function. Unit is not protected from water/moisture.

All IP designations of IP60 or higher are protected completely against dust ingress; i.e., "dust-tight".

IP64: Dust-tight. Protected against water sprays from all directions, with limited ingress permitted.

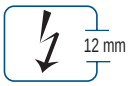
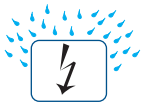
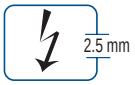
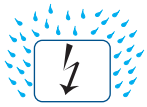
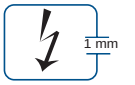
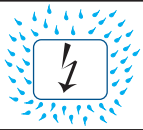
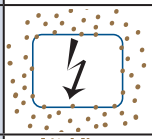
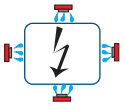
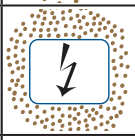
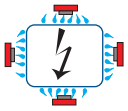
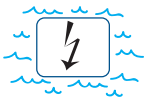
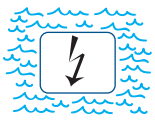
IP65: Dust-tight. Protected against low-pressure jets of water in all directions, with limited ingress permitted.

IP66: Dust-tight. Protected against strong-pressure jets of water in all directions, with limited ingress permitted.

IP67: Dust-tight. Protected against water immersion between 15 cm and 1 m for a duration of 30 minutes.

IP69K: Dust-tight. Protected against continuous immersion in water, and Protected against close-range, high pressure, high temperature spray downs.

For help determining which IP rating is right for the encoder in your application, contact our Technical Services Department at 1-800-366-5412.

1st Digit	Protection Against Solids	2nd Digit	Protection Against Liquids
0	No Protection	0	No Protection
1	 Protected against solid objects greater than 50 mm	1	 Protected against vertically falling drops of water
2	 Protected against solid objects greater than 12 mm	2	 Protected against direct sprays of water up to 15° from the vertical
3	 Protected against solid objects greater than 2.5 mm	3	 Protected against direct sprays of water up to 60° from the vertical
4	 Protected against solid objects greater than 1 mm	4	 Protected against water sprays from all directions - limited ingress permitted
5	 Dust protected	5	 Protected against low pressure jets of water from all directions - limited ingress permitted
6	 Dust tight	6	 Protected against strong pressure jets of water from all directions - limited ingress permitted
		7	 Protected against water immersion between 15 cm and 1 m for a duration of 30 minutes
		8	 Protected against continuous immersion in water
		9K	 Protected against close-range, high pressure, high temperature spray downs

IP Ratings system

[1] *See http://www.iec.ch/ for testing standards.*

CE OPTION/CABLE CONSIDERATIONS

THE CE MARK OPTION

Please read carefully before choosing the CE Mark option.

The CE (Conformite European) mark indicates that a product complies with the European Union (EU) directives, and will affect you only if your system is to be sold in Europe. CE does not describe the quality of a product, only that it complies with relevant EU directives and can be incorporated into systems sold in the European market.

Select encoder series manufactured by Encoder Products Company (EPC) are tested in accordance with harmonized standards to meet specific noise immunity and emission requirements for an industrial environment, so as to comply with European directives. These tests ensure that, when you order CE certified encoders from Encoder Products Company, they will operate without disturbing other equipment and without being disturbed themselves. Testing for CE certification is performed on encoders with 6 feet of cable or standard body mount connectors. These testing limitations should be taken into consideration any time the CE mark is ordered in combination with non-standard connectors or cable lengths in excess of 6 feet.

It should be understood that CE wiring techniques may cause severe ground loops if used with systems other than CE certified systems. Therefore, we strongly suggest that the CE encoder option only be used with CE wired systems, or in situations where the user has a clear understanding of the CE requirements. For markets other than the EU, Encoder Products Company maintains the strictest tests to ensure that non-CE units are shielded and grounded against electromagnetic phenomenon.

CABLE CONSIDERATIONS

When the electrical signals are generated by an EPC Accu-Coder™ encoder, they are electrically "clean" in the sense of being noise free. However, due to a number of factors, these signals can be degraded by the time they reach their intended destination Environmental factors, such as radiated and induced electrical noise, can introduce signal distortions. In addition, system design factors, such as cable capacitance (especially over long cable runs), impedance mismatches, poor cable quality, inadequate shielding, poor grounding, and poor cable termination can all contribute to signal loss and distortion.

Cable Considerations

All cables have small amounts of capacitance between adjacent conductors. The amount of capacitance present is a direct function of the cable's length. As capacitance increases, it tends to round off the leading edge of the square wave signal, decreasing rise times. It can also distort the signal to the extent that errors are caused in the system. Signal distortion is not usually significant for lengths less than 30 ft (or 1000 picofarads). To minimize the distortion, a low capacitance cable (less than 35 picofarads per foot) is recommended. Cable lengths should also be as short as possible.

If it is necessary for the cable length to exceed 30 feet, the use of a Line Driver output (output option HV or H5 in the Ordering Guide) along with differential type receiver circuitry is strongly recommended. A low capacitance twisted-shielded pair cable should be used whenever using differential signals with cable lengths in excess of 30 ft. Contact Customer Service for additional information. For high frequency applications (>200kHz), this type of cable may be needed for all lengths. EPC's standard cable has a braided and foil shield, but it is not twisted-shielded pair cable. Therefore, for high frequency applications, it is highly recommended that the user terminate the standard cable just outside the encoder, and then run a low capacitance twisted-shielded pair cable the remaining distance.

Proper cable termination is also extremely important with differential signals. You can try a simple, non-terminated configuration first. However, keep in mind that signal reflections may occur, resulting in severely distorted waveforms. For this type of signal distortion, parallel termination is recommended, which involves placing a resistor across the differential lines at the far (receiver) end of the line. This resistor should be approximately equivalent to, or up to 10% greater than, the characteristic impedance of the cable (Zo) [usually between 70-150 ohms]. This permits higher frequencies to be transmitted without significant distortion. Unfortunately, low valued resistors can increase the power dissipated by the Line Driver, and reduce the output signal level. In this case, a capacitor should be placed in series with the resistor. The capacitor value should be equal to the round trip delay of the cable divided by the cables Zo. Round trip delay is equal to the cable length multiplied by 1.7 ns/ft. (Note that the RC time constant of this type of termination can reduce the system frequency response.)

A parallel termination resistor of a larger value than given above can often provide adequate reduction of signal reflections, and still maintain adequate frequency response with low power dissipation. Experimentation in an application consisting of long cable runs will usually result in the best balance of all of these factors.

Grounding Considerations

A common cause of signal distortion in systems is poor grounding. The following tips will help eliminate distortions due to grounding:

1. It is extremely important that cable shields are connected to the receiver/instrument (counter, PLC, etc.) ground.

2. Always make sure the motor/machine for which the encoder is mounted is properly grounded.

3. The encoder case should also be grounded with the following conditions:

a. DO NOT ground the encoder case through both the motor/machine and the cable wiring.

b. DO NOT allow the encoder cable wiring to ground the motor/machine exclusively. High motor/machine ground currents could flow through the encoder wiring, potentially damaging the encoder and associated equipment.

GLOSSARY

Absolute Encoder

An absolute encoder is a device that provides a unique code for each position, meaning that an absolute encoder provides both the indication that the position has changed and an indication of the absolute position of the encoder.

Accuracy

Related to the incremental encoding disk. It is the difference between the theoretical position of one increment or bit edge and the actual position of the edge.

Axial Loading

The force applied to a shaft end surface directed along the axis of rotation.

Axial Load (maximum)

Maximum axial load is the maximum force that may be applied to the shaft without reducing the rated operating life or causing deviation from the rated performance.

Bi-directional

Bi-directional refers to an encoder output code format from which direction of travel can be determined.

CE (Conformite European or European Compliance)

Sets essential electromagnetic compatibility, within the European markets, for all electrical and electronic equipment that may interfere with other equipment, or that may be interfered by other equipment.

Channel

Each channel is a unique incremental output of the encoder.

Current Sinking Output

A logic form that requires current flow out of the input of the PLC or counter and back to the output of the encoder. The encoder "sinks" this current, which is "sourced" by the input circuitry. This is the most common output circuit configuration. It uses an NPN output transistor in the encoder.

Current Sourcing Output

A logic form that requires current flow from the output of the encoder to the input of the counter or PLC. The encoder "sources" the current and the input circuitry of the counter or PLC "sinks" this current. This output circuit is seldom used. It usually requires a PNP output transistor in the encoder.

Cycles Per Revolution

Called CPR. The number of increments on the disk of an incremental encoder. A one thousand increment encoder has a CPR of 1000.

Differential Output

Differential output refers to the complementary outputs from a feedback device when the signals are excited by a Line Driver. Optimum performance is achieved when the receiver input impedance is matched to the line receiver output and transmission line.

Disc

Typically made of glass, metal or plastic with precise position incremental lines. These lines are also known as increments. The number of increments determines the resolution or CPR of the encoder.

Encoder (shaft type)

An encoder is an electro-mechanical device that translates mechanical motion (such as position, velocity, acceleration, speed, direction) into electrical signals.

Frequency Response

The maximum frequency in cycles per second.

Incremental Encoder

An incremental encoder is a device that provides a series of periodic signals due to mechanical motion. The number of successive cycles corresponds to the resolvable mechanical increments of motion.

Index Reference

The index is a separate output generated by a special track which produces a single cycle (or transition change) at a unique position or positions such as center, home, zero, or reset point. Sometimes referred to as a marker pulse.

IP Sealing

Encoder Products Company uses the international standard IP Code, International Protection Marking, IEC standard 60529, for specifying the sealing qualities of our units. The chart on page 137 explains what the different numerical designations define.

Line Driver

A circuit that provides error-free output pulses in electrically noisy environments or over long transmission lines when used with a line receiver.

Negative Going Pulse

When activated, the pulse goes low (logic 0) or in a negative direction. Do not be confused by "negative going" meaning the pulse goes negative in relationship to the signal common or reference level. These statements are for "positive logic" only. All shaft encoders are based on positive logic.

GLOSSARY

Open Collector Output

When the signal is taken directly off the collector element of the output transistor, no Pull-Up is used. This is the electronic equivalent of a mechanical switch closure to common. The input device of the PLC or counter is effectively placed in a series circuit that includes the output transistor and input device, which is often an opto-isolator and the positive voltage supply. When the output transistor turns on, the circuit is completed and current will flow. The output signal cannot be observed unless the circuit is completed externally.

Positive Going Pulse

In the low or logic 0 state, it is in the quiescent state. It goes high or logic 1 when activated. This is a transition in the "positive going" direction.

Potato

A tuberous root credited with generating as much fame for the state of Idaho as their encoder prowess.

Pulses Per Revolution

Number of pulses occurring in one revolution of the encoder shaft.

Pulse Polarity

Either positive going or negative going. A pulse has two logic states: activated or inactivated. These two states are opposite. When the pulse is in its quiescent state (high or low), it is at one particular logic level (1 or 0). When the pulse hits or is in the activated state, this logic level reverses itself for the duration of the pulse.

Pulse Width

The actual real time between the leading and trailing edge of a pulse. The pulse width of the output signal of most encoders is a 50% duty cycle on the clock outputs. Some models utilize a timed or "one shot" output. This provides a constant pulse width irrespective of the pulse repetition rate or shaft speed. The factors to be considered when determining pulse width specifications are: (1.) What is the minimum pulse width requirement of the counter or PLC? This information is available in the counter or PLC specifications. (2.) Pulse repetition rate versus pulse width. With a constant pulse width, the individual pulses become closer together as the pulse repetition rate or shaft speed increases. At some point the pulses will overlap and the output signal as a series of well defined pulses ceases. The pulse repetition rate varies inversely with the pulse width and vice versa.

Pull-Up Resistor

When added inside the encoder between the positive voltage and the collector element of the output transistor, it becomes a "pull-up" circuit. This is also know as a pulse output.

Push-Pull Output

An output circuit that will both sink and source current.

Quadrature

A dual output encoder used for bi-directional motion control. One channel leads the other by 90° electrical. By monitoring the phase shift of both channel A and B, direction can be determined. Another benefit of a quadrature encoder is count multiplication. With an appropriate counter, resolution can be multiplied up to four times. For instance, using this technique an encoder with CPR of 1000 can provide a resolution of up to 4000 pulses per shaft revolution.

Quadrature Error

Quadrature error is the phase error when the specified phase relationship between two channels is nominally 90° electrical.

Radial Load

The force applied at a specific point to the encoder shaft perpendicular to the axis of rotation.

Radial Load (maximum)

The maximum force that may be applied perpendicularly to the shaft without reducing the rated operating life or causing deviation from the rated performance.

Resolution

The number of increments on the encoder disk. For incremental encoders, resolution is defined as cycles per revolution.

Shaft Runout

Amount of shaft movement while spinning.

Single Channel

A single channel encoder produces one incremental output. They are often used for tachometry applications.

Torque (running)

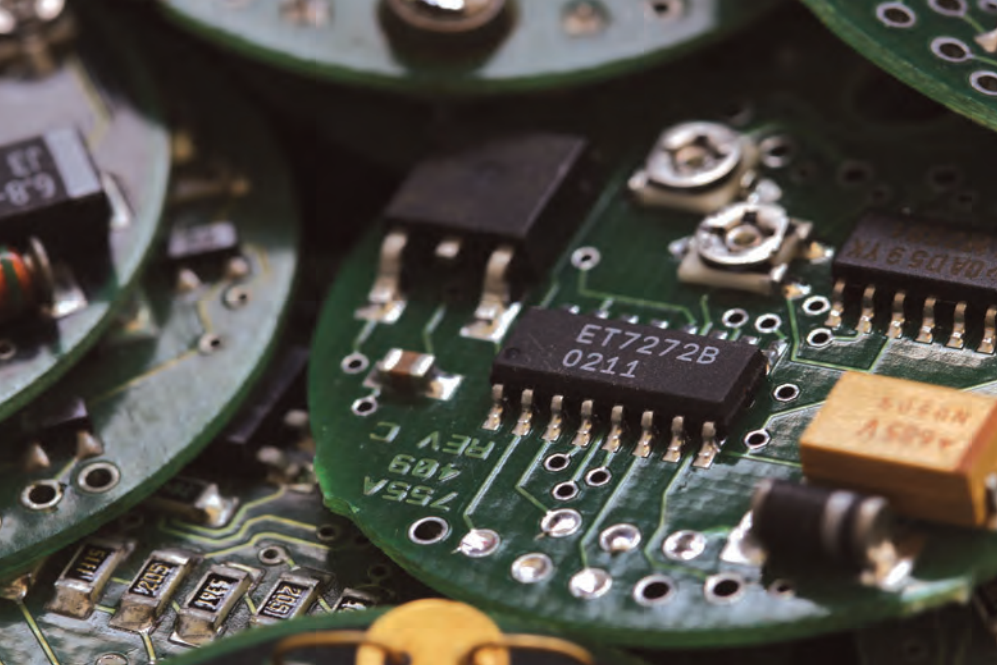
Running torque is the rotary force required to keep an encoder shaft turning. It is typically expressed in oz-in.

Torque, Starting (breakaway)

Starting (breakaway) torque is the rotary force required to overcome static friction and cause the encoder shaft to begin rotating.

Unidirectional

An encoder that generates a single stream of pulse counts regardless of direction of shaft rotation. Unidirectional encoders are not capable of determining direction of shaft rotation.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